THE FOUNDRY

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MAGNESIUM
FOR POWERFUL AIRCRAFT

MADE WITH
LINOIL "38"

by
HOWARD FOUNDRY CO.
CHICAGO

Linoil "38" is young in years but old in experience. Compared
Linoil's thirty years of service No. "38" is a mere infant, but it h
already become an "old reliable" in magnesium foundries. Lino
"38" was developed expressly for magnesium work and to a gratifyi
degree it meets all the requirements peculiar to this metal.

For instance, the low baking temperature of Linoil "38" permi
the incorporation of inhibitors directly in the core sand mix. T
inhibitors are not burned out in the oven. Temperatures as low
350°F. are used.

The binding strength of Linoil "38" permits it to be used in rati
as high as 1-130 to 1-150. This gives cores strong enough for the nece
sary handling, and that still are readily collapsible from the l
thermal capacity and the high shrinkage rate of magnesium.

Small gas production, a factor especially important in magnesiu
is a characteristic of Linoil "38".

Cores made with Linoil "38" are sufficiently cohesive to stand t
flow of metal without sand particles washing loose to be picked up
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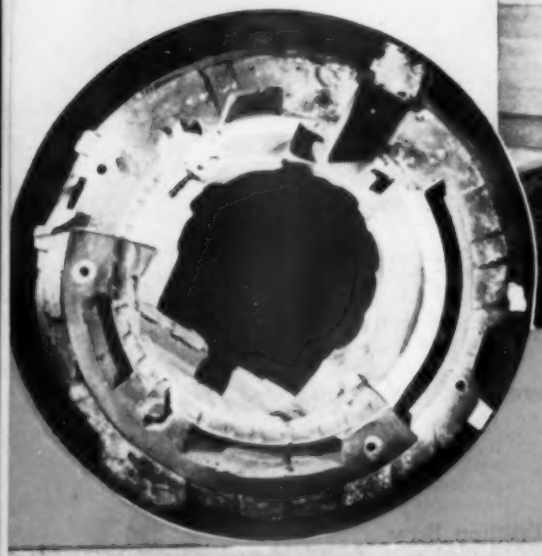

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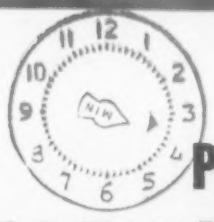

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Postwar Foundries Must Attract Men

THE hour was late, and already a few had slipped out to catch their trains. The program had been long because so much had to be accomplished in one evening. But now the last speaker had been reached. Max Kuniansky was introduced to discuss "Castings in the Postwar Industry". Many probably thought the time was insufficient to do justice to that important subject.

Time was not a factor. In a little over 300 words, Max outlined the progress of a quarter century in gray cast iron, and pointed to perhaps the greatest postwar need for the entire foundry industry. When the meeting adjourned a few minutes later, everybody in the room was praising the talk.

No stenographic report was made, but the following is the gist of the speaker's remarks, as he remembers them:

"During the past 25 years progress in the gray iron industry has been great and I believe that progress is symptomatic of the progress in the other branches of the foundry industry. We have seen accepted tensile strengths advance from 25,000 to 75,000 pounds per square inch. We have seen gray cast iron accepted for uses in steam at temperatures of 650 to 750 degrees F instead of the former 450 degrees. We have seen improvements in the art of casting due to the research work on sand testing, especially that at high temperatures. We have seen improvements in metallurgy due to the advances in the art of melting, some of these improvements being: The balanced blast cupola; the hot blast cupola; use of the air weight meter; use of moisture control for the cupola blast; mixing ladles, desulphurizing of the iron; and rapid strides made by inoculants. All of these have improved the engineering properties of gray iron.

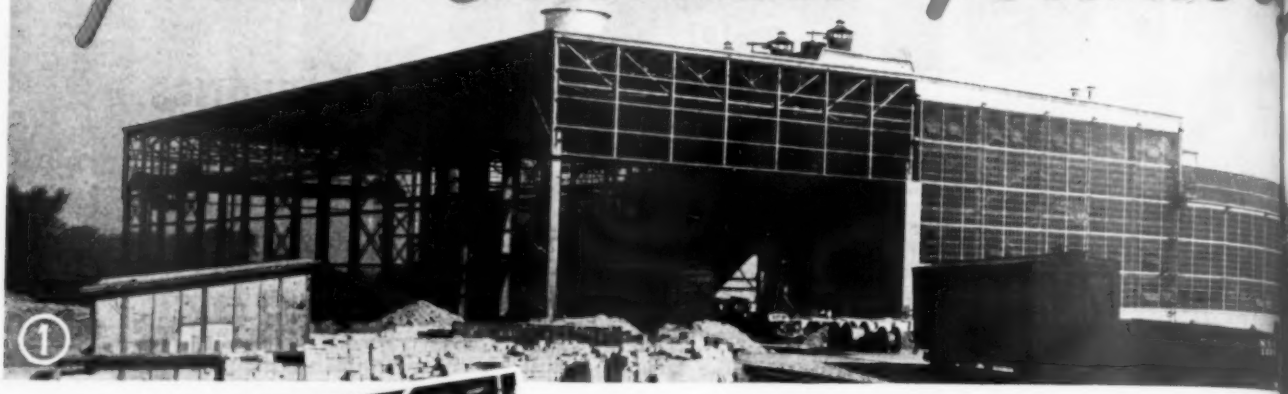
"But with all these advances, the future of the foundry industry cannot be considered secure or bright until we recognize that no industry is built on machines; it is built on men. Unless we in the foundry industry can improve our plants to the point where they are attractive places in which to work, we will not in the future attract the kind of young men that we should have. We must educate the public on our industry. I was shocked to have an executive of one of the larger New York plants tell me that he was dismayed that we still made castings in "dirt". It is our fault that to him molding sand is just "dirt".

"The foundation of an industry rests upon men and its future depends on its capacity to develop men. We must face the issue clearly and resolve to do the job of attracting the proper men and developing them in our industry".

Printed words cannot carry the warmth and conviction that flowed from the speakers' table at that AFA business meeting in Chicago. I wish every foundryman could have been present for that inspirational talk.

Frank G. Steinebach
Editor

New Malleable Foundry



WAR'S HUGE appetite for malleable castings has necessitated the building of new foundries and facilities incorporating improved operating practices, machinery and equipment. A notable example in this respect is the new plant at Ashtabula, O., designed and operated by the Lake City Malleable Co.

The Lake City Malleable Co., Cleveland, was organized in 1928 to take over the foundry business of a predecessor concern which had been producing malleable castings since about 1890. The business is therefore over 50 years old and has established a position in the manufacture of malleable castings for the requirements of over 400 important manufacturers of trucks, tractors, tools, farm and shop machinery, and equipment of many other kinds. In 1937, as a step to building up adequate capacity, the Lake City Malleable Co. acquired substantial ownership and control of its present subsidiary, Columbus Malleable Iron Co., Columbus, O.

Fig. 1—Exterior of plant taken shortly after completion, showing receiving tracks for raw materials. Tremendous expanse of glass insures adequate lighting. Fig. 2 — Charging floor for the cupola, showing a 3-ton charging crane delivering the charge by means of a bucket. Fig. 3 —One of the air furnaces discharging metal into a 1000-

As needs of the war developed, customers of both old plants converted from peace to war production and made increasing demands for larger tonnages of malleable iron. Early in 1943, both old plants were being operated at as near maximum capacity as possible but could not produce the tonnages desired by customers who had then become committed to very large war programs.

Shortage of malleable castings became so widespread and critical that customers of the Lake City Malleable Co. made continuous and repeated representations to the armed services and to the War Production Board in Washington, urging an expansion of facilities which would enable the company to supply a larger part of the tonnage demanded by increasing government programs. During the last half of 1943, these representations became so insistent that the WPB approved a new plant to be built at Ashtabula, O., for the manufacture of 2000 tons of malleable iron castings per month.

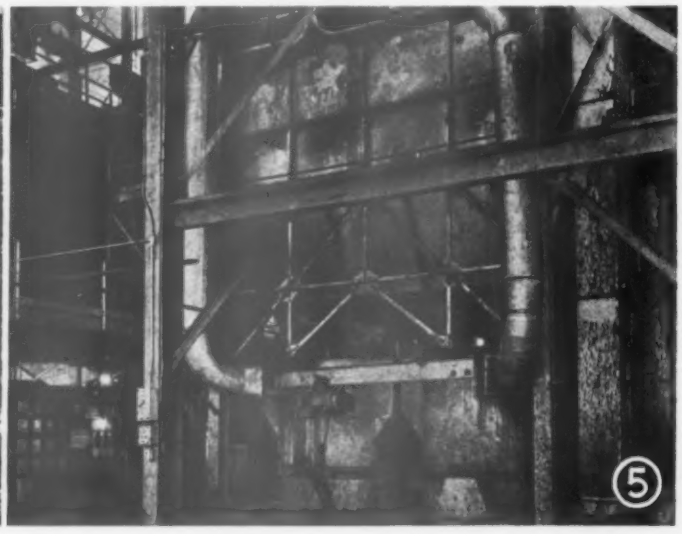
This project was approved by the board of directors of the Defense Plant Corp. on Dec. 3, 1943. The Lake City Malleable Co. was made the agent of DPC for erecting and equipping this new facility and under contract with DPC became the lessee of the plant for the purpose of operating it as soon as completed. A new subsidiary, Lake City Malleable Inc., was organized for that government project. The new plant was designed, built and equipped for the purpose of rapid and economical production of malleable castings, with the co-operation, engineering and latest developments of the most progressive manufacturers of foundry equipment in America. The lessee was given every possible assistance and received the complete co-operation of government in priorities, expediting and other aids toward completing the project at the earliest possible date.

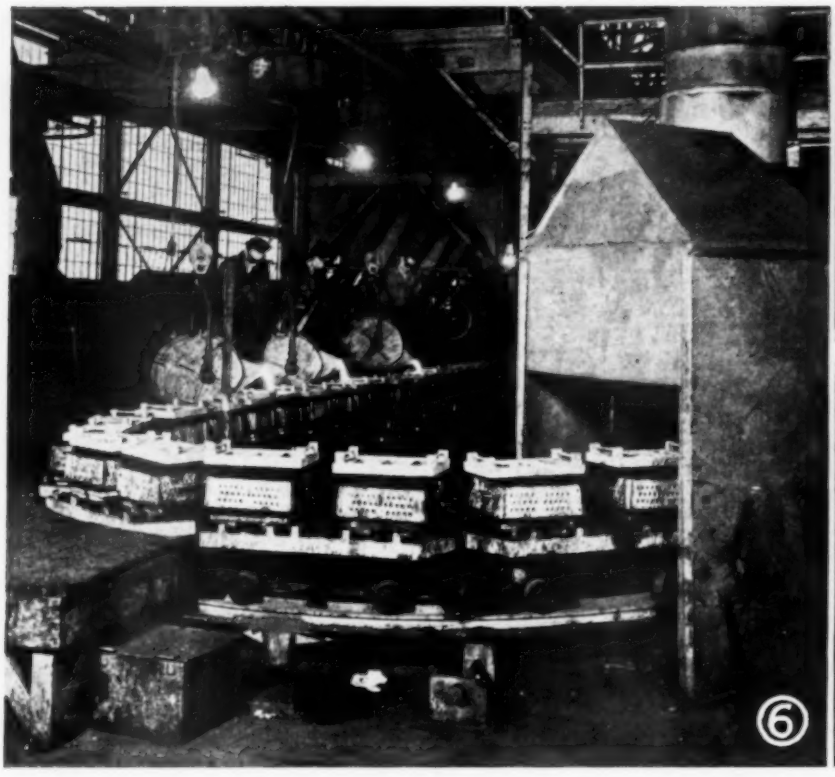
Many Plants Erected Rapidly

Building of the new foundry is typical of the speed with which many new war production plants have appeared quickly on ground which formerly had been barren or farm land. Ground at Ashtabula was broken on the 55-acre plot in January, 1944. On March 9 of that year the first steel columns for the plant building were erected, and slightly less than three months later, on June 5, the new plant was far enough along that the first iron was poured. Production was the prime consideration and no attempt was made to provide spacious quarters for the office personnel; the staff merely moved into the temporary buildings vacated by the construction contractor—and it is still there. Production has been expanded monthly as fast as the plant itself could be put in shape for manufacture and as fast as personnel could be employed and trained for the various operations. As this is written, and although the plant is not yet completed, it has already shipped several thousand tons of castings. Since the new plant is not yet completed and has been started up with entirely green help, the present rate of production is only about 60 per cent of what will be expected as soon as the entire plant has been completed and the employees trained for efficient production.

During the entire period of construction at Ashtabula, the Lake City Malleable Co. has increased production at Cleveland and Columbus above all earlier totals, despite the loss of men to the draft, shortages of manpower at

lb ladle. Pulverized coal duct is shown emerging from the underground tunnel at left. Fig. 4—Molds are handled on conveyors, which are hooded for ventilation. Fig. 5—Storage hopper and sand mullers, with control panel at left. Casing at right encloses bucket elevator which delivers spent sand from shakeout to storage hopper



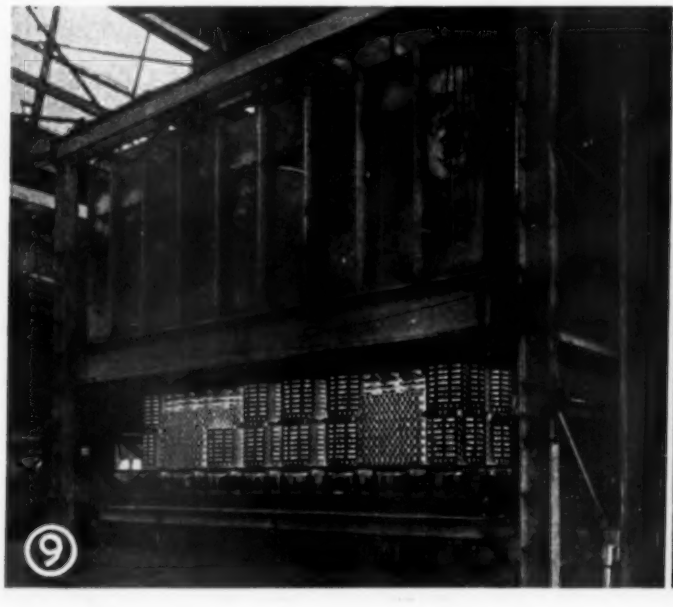


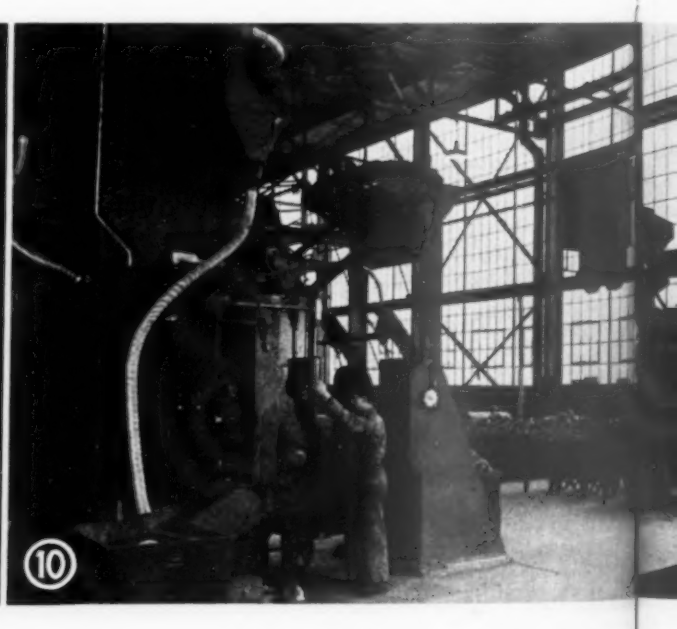
both Columbus and Cleveland and the loss of supervision through transfer of executives to the new plant.

The castings made at all three plants have been for use in heavy government war trucks, fragmentation bombs, couplings for invasion pipe lines and other similar critical items. The output of the new plant has relieved serious shortages of malleable castings for some of the most important producers of war materiel. Production is increasing rapidly on other urgently needed castings which could not otherwise have been supplied.

The main foundry building at Ashtabula, measuring 240 x 790 ft, appears at first glance to be almost a greenhouse. Walls on three sides are brick for 5 ft above the ground but for their remaining 32 ft are clear glass windows. Those on the south side are green to reduce sun glare. The roof is topped by three large monitors, also made up largely of windows, to give the structure a total of more than 2 acres of windows and glass. Adequate provision of equipment to arrest dust generated within the building and the fact that the plant is not located in a highly industrialized area make the task of keeping the windows clean insignificant. Obviously, this building design affords an unusual amount of natural illumination and, when combined with careful control of dust and smoke, wide aisles and correct spacing of equipment, helps to provide highly satisfactory working conditions. These conditions likewise have a beneficial influence on quality of product.

A separate structure, located near one end of the foundry, provides heat and compressed air. Electric power is





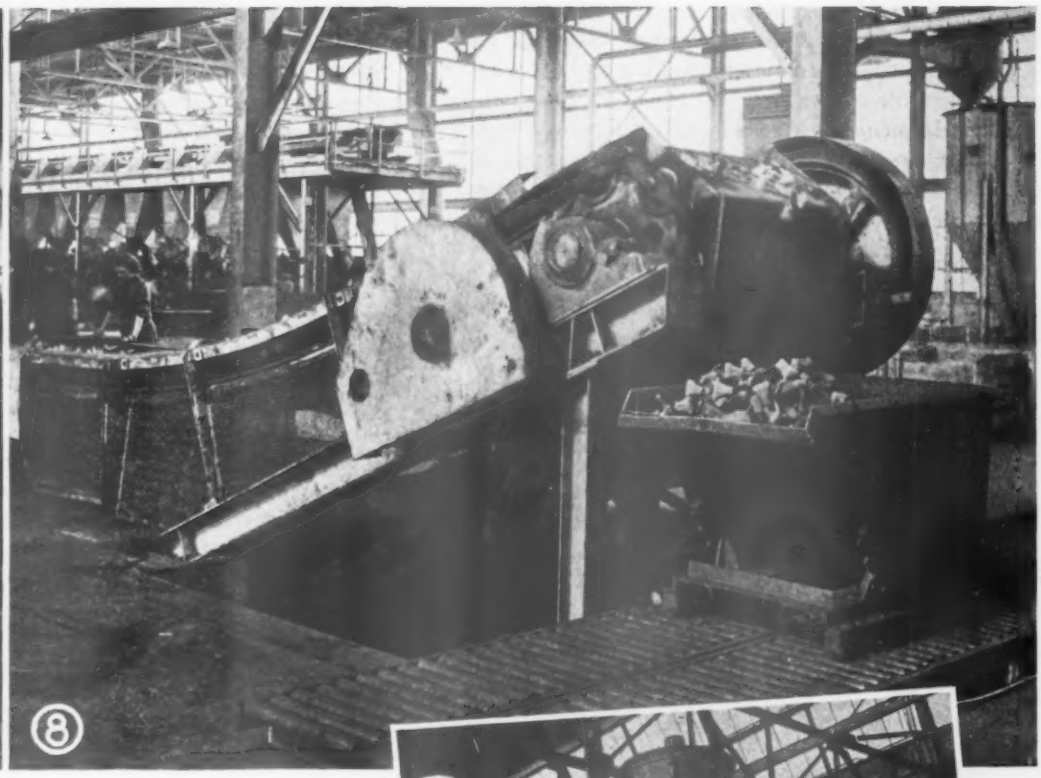


Fig. 6—Pouring station, showing type of ladle used. Jackets and weights are placed on mold midway between molding station and pouring platform

Fig. 7 — Molds are dumped automatically to shakeout below floor

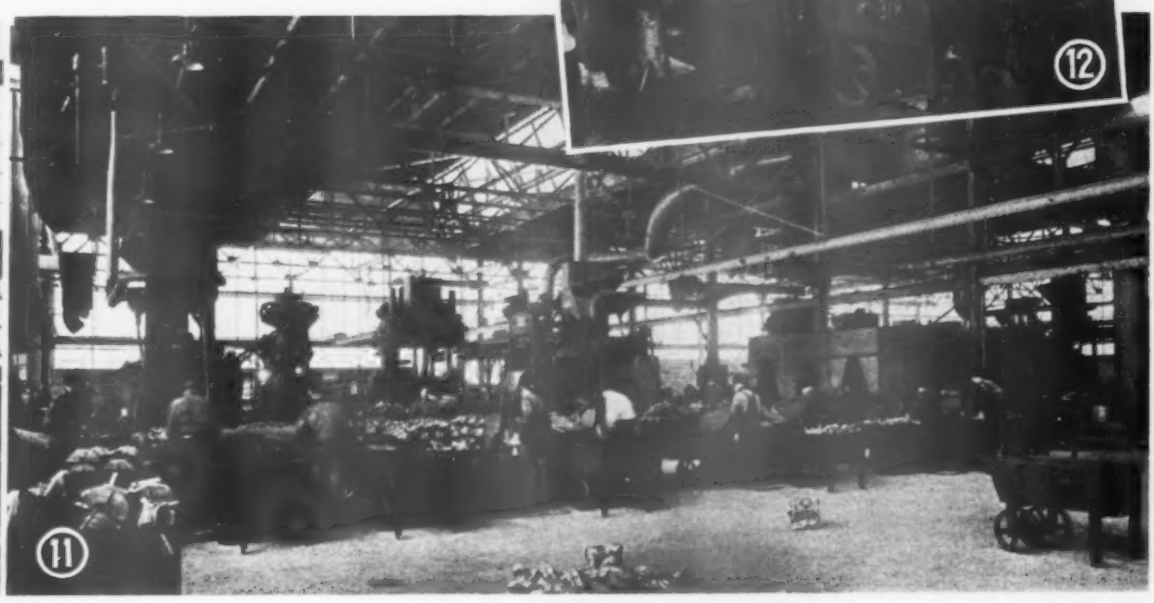
Fig. 8—Conveyor from shakeout to hard iron inspection station permits castings to cool. Sprues fall off the discharge end into container for transportation to yard storage and remelting

Fig. 9—Car just removed from electric annealing ovens

Fig. 10—Cleaning department shows good housekeeping and excellent lighting provided by wall of glass

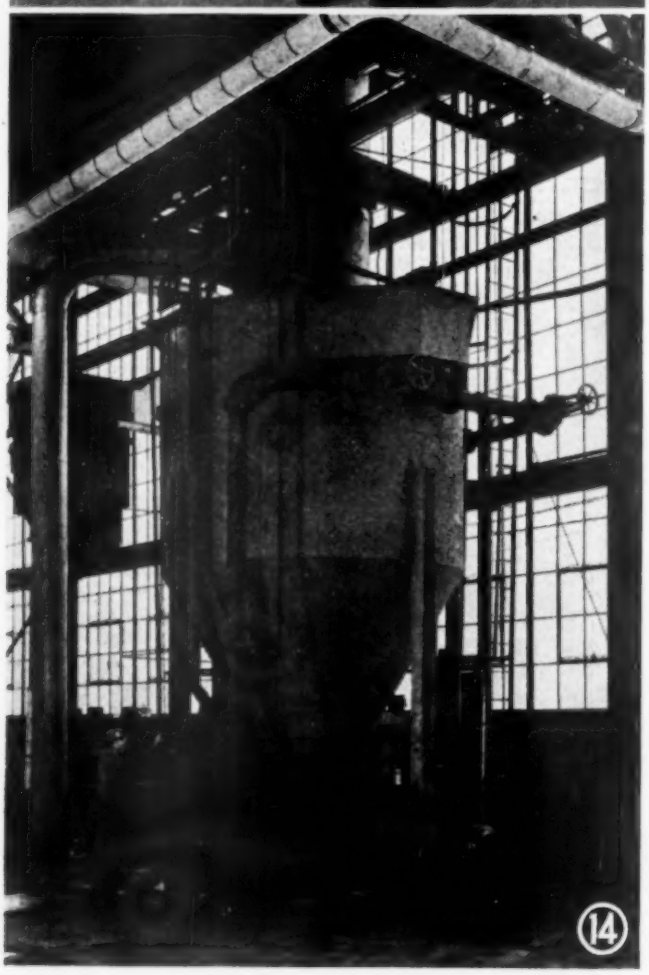
Fig. 11—Section of the grinding department

Fig. 12—Small castings are straightened and coined on hydraulic presses



purchased. Nearby are silos for storage of coal and underground tanks for storage of fuel oil and core oil. Fuel oil is required for ladle drying and heating of core ovens. Gas is not available in the area.

Plant departments are laid out so that operations proceed in a straight line the length of the building and require a minimum of handling of the castings from their pouring to final inspection. A high degree of mechanization has been achieved in material handling as a whole, including mechanical charging of the cupolas and use of various types of conveyors for transferring sand, coal, hot metal, molds, castings and sprue. Material passes progressively through the melting, molding and coremaking, annealing, and finishing departments—an arrangement that practically eliminates any backtracking in the flow of production.



Summarizing briefly some of the more important features of the plant, the malleable castings produced range in weight from 1½ to 175 lb. Duplex melting practice is followed, employing four cupolas and three pulverized-coal-fired air furnaces. Three continuous conveyors handle molds for the smaller castings made on machines, while additional machines produce molds for the larger castings. Shakeouts are located in tunnels below the foundry floor. Mechanical equipment for preparing and distributing sand to molding stations includes four mixers. Annealing equipment consists of 14 electric ovens and is regulated from a central control room. Exhaust piping in the cleaning department is under the floor, eliminating overhead obstructions. The plant is served by wet type dust collectors, and accumulated sludge is disposed of through pipe leading from the plant to a ravine on the property.

Melting equipment is located at one end of the foundry building where the roof is about 20 ft higher than the remainder of the plant. Four cupolas are located in relation to three air furnaces so that the latter can receive hot metal from either of two cupolas. This arrangement accommodates the necessity of operating a cupola on alternate days to allow for repairs. Slag from the cupolas flows through a powerful stream of water which granulates it.

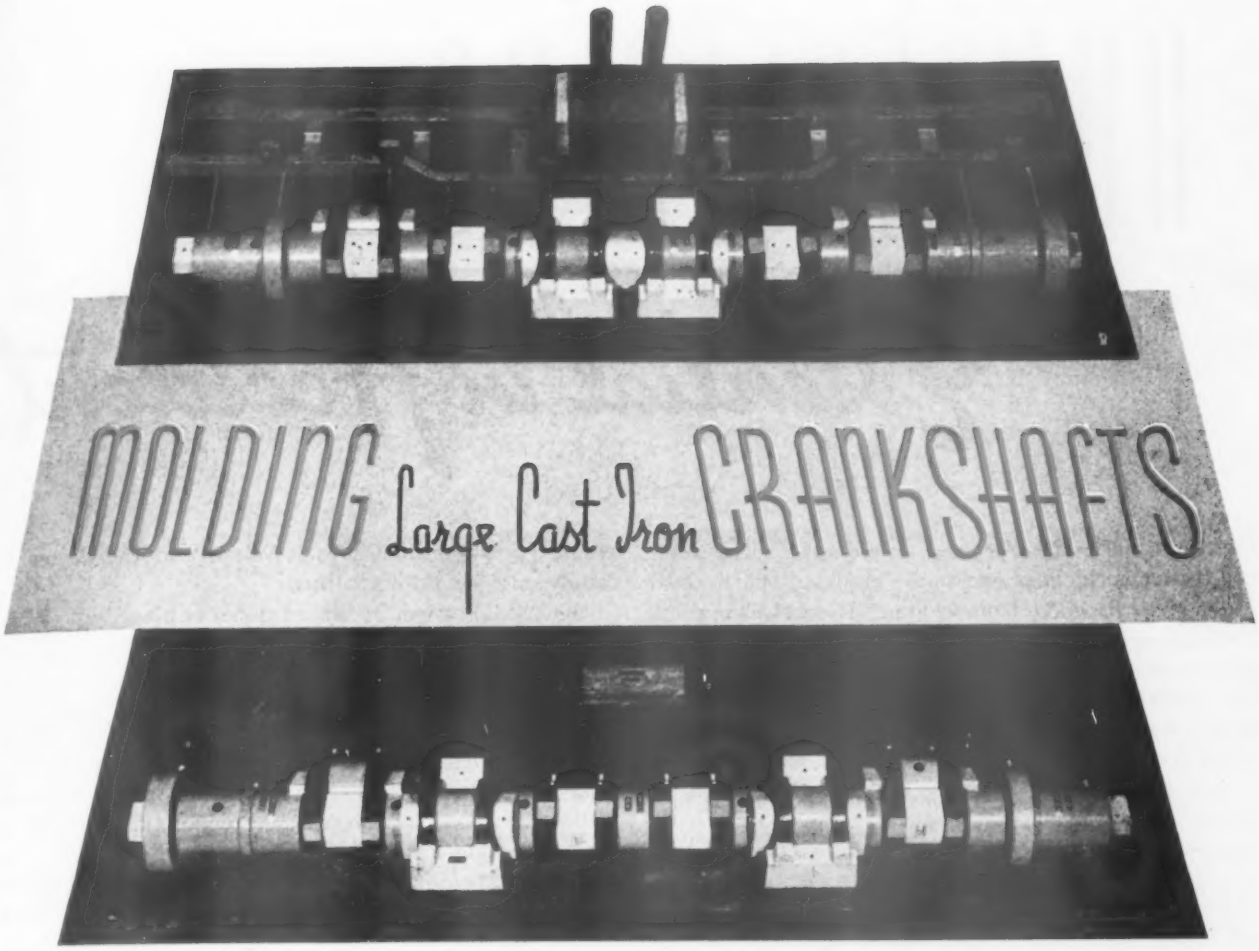
Raw Materials Stored Under Cover

Pig, scrap, coke and limestone for the cupola charges are stored under cover in a storage yard which runs the full width of the building just behind the melting department. Ferrous materials are kept in piles, and the coke and limestone are stored in elevated hopper bins near the wall and in the center of the yard. Round, bottom-dump charging buckets on small cars are run under a platform with hoppers filled with metals for melting, and then under the coke and limestone bins, where the proper weight of those materials is dropped in. The car and bucket enter the building where the bucket is picked up by a crane, elevated to the charging door, run into the cupola and discharged. Ferrous materials are picked up from their respective piles by a magnet attached to a 10-ton crane and carried to the loading platform just behind the bins containing coke and limestone.

Molten metal from the cupola flows down a spout into the air furnace near the stack end. Each of the air furnaces is fired by pulverized coal.

Procedure in melting is to tap the cupola about 6 a.m. and run 25 tons of the molten metal continuously into the air furnace. Skimming and finishing takes about 1½ hours, and at 8 a.m. the first bull ladle is filled. The bull ladles are cylindrical, insulated type and hold 1000 lb. Bull ladles suspended from electrically operated hoists on a loop monorail transport the (*Please turn to page 226*)

Fig. 13—Swing frame grinders are enclosed to provide adequate ventilation. Fig. 14—Wet type dust arrester unit



MOLDING Large Cast Iron CRANKSHAFTS

Hundreds of cast iron crankshafts varying in length from 9 to 15 ft, with pins and journals from 7 to 9 in diameter, were made from patterns split through the center. Upper view shows cope pattern with elaborate gating system. Lower shows drag half of pattern. The mold was poured in a vertical position

THREE recognized methods of casting large crankshafts include: 1—Vertical pouring and cooling. 2—Horizontal pouring and vertical cooling. 3—Horizontal pouring and horizontal cooling. Advantages and disadvantages of each method appear in the following presentation.

1—**Vertical pouring and cooling.** Any crankshaft poured in a vertical position, of necessity must be gated from the top of the mold to the bottom and the metal fed into the mold cavity progressively from the bottom up. This entails the hazard of erosion of sand in varying degrees from the down sprue, depending on the height the metal must drop before entering the first or lowest ingate. Therefore, it is very difficult to prevent sand and slag from entering the mold, where they are trapped in many places due to irregularity of mold contour. The result is a scrap casting. Experience, particularly on shafts of extreme length, shows that it is impossible to obtain uniform physical properties from one end of the shaft to the other when poured and cooled in this manner.

While a progressive gate *does* feed hot metal into the mold, the temperature of the mass in the mold cavity naturally decreases as it rises to the top of the mold. Pouring speed exerts a marked influence on temperature variation between the bottom and top of the mold. All ingates must be kept small enough to bypass inclusions as the metal rises in the down sprue. This means relatively slow pouring speed with consequent decrease in temperature. Shafts poured in this manner must be topped with a feed head of suitable dimension. In solid shafts where the design facilitates good shrinkage flow, relatively sound castings can be obtained.

In shafts where pins and journals are cored in a manner to create quick changes in metal sections, and where throws are separated by comparatively short journals, the shrink head functions effectively in the first throw, but, due to rapid changes of angle from one throw to the next, each successive lower throw cools more or less as a separate casting with resulting shrink cavities and hot tears usually adjacent to the heaviest section of the throw.

Shafts poured and cooled vertically present complex sand problems, due to exposure of the bottom of the mold to the hottest metal and to the effect of ferrostatic pressure. It is extremely difficult to prevent burn-in, particularly where pin and journal cores of small diameter are surrounded by metal of heavier section than (*Please turn to page* 232)

By GEORGE JOHNSTONE
Foundry Superintendent
Cooper-Bessemer Corp.
Grove City, Pa.

HOUSEKEEPING___

Essential in Accident P

ONE of the most direct and simple approaches to effective accident prevention in any kind of industrial activity is good housekeeping. Housekeeping has the advantage of being an undertaking which can be carried on in any size or type of foundry with definite, tangible results in the reduction of accident hazards. In a cluttered floor area, for example, you can actually *see* the tripping hazards disappear when the floor is cleared and kept in good order.

Housekeeping has another advantage in that it is an activity in which everyone working in a foundry can take part. It does not require special skills. In an ultimate analysis, good housekeeping is primarily an attitude or a habit. Once it becomes a *shop* habit, the benefits accrue almost automatically without undue stress or strain on any individual. Housekeeping, however, is not particularly spectacular. It is ordinarily concerned with what might be called chores—picking up and putting away. Possibly this is one of the reasons why housekeeping does not interest some people.

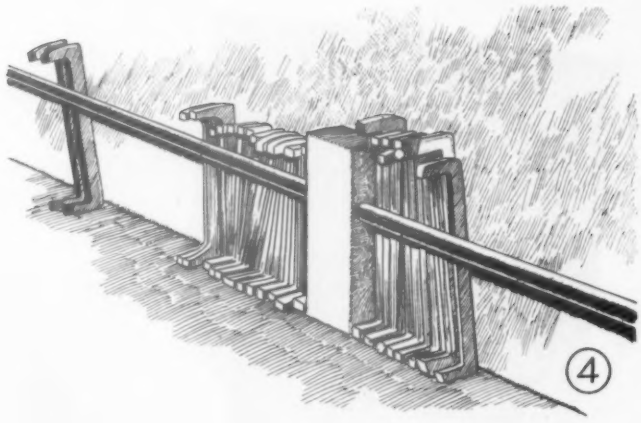
Where housekeeping is regarded in some superficial manner such as a possible refinement, an extra flourish or a third rate consideration, its fundamental advantages are not usually understood. On this basis, the real reason for poor housekeeping is the failure to recognize good housekeeping as a definite factor in efficient shop operation. Housekeeping ordinarily is developed to the degree its significance has been accepted.

Housekeeping can be played down or played up. When you play it down, you generally wind up with an arrangement which is no credit to anything but the strength of your convictions. You usually have missed out on some of the proven operating advantages found in an orderly, well-maintained shop. When housekeeping is played up, your foundry will be producing castings with a minimum of the visible and hidden wastages which poor housekeeping can be shown to cause.

A good percentage of reported foundry accidents are the ordinary run-of-the-mine type—trips, falls, strains, bumps, bruises, etc., caused quite frequently, directly or indirectly, by poor housekeeping. From a straight accident prevention angle, there is no more direct method of controlling these than by improved orderliness. Poor housekeeping tends to increase the *number* of exposures to accident hazard. The illegitimate, unnecessary exposures which a lack of good housekeeping often produces make it difficult to get at and correct the *honest* hazards.

The reported occurrence of accidents in the foundry industry might be said to be on the high side. There are, however, a number of individual foundries, large and small, who have established enviable safety records and thereby have demonstrated that (*Please turn to page* 254)

By RALPH R. MEIGS
Loss Prevention Department
Liberty Mutual Insurance Co.
Boston



nt Prevention

Fig. 1 — While housekeeping is not always a matter of racks, fixtures and bins, it is true that racks or definite floor areas for various types of tools provide an important factor in successful housekeeping procedures

Fig. 2 — Patterns and matchplates should be stored in orderly fashion when not in use

Fig. 3 — Gangways must be kept clean at all times. Many preventable accidents are caused by trips and falls resulting from neglected housekeeping

Fig. 4 — Racks for storing clamps and other items can be improvised easily. Clamps in poor condition should be scrapped

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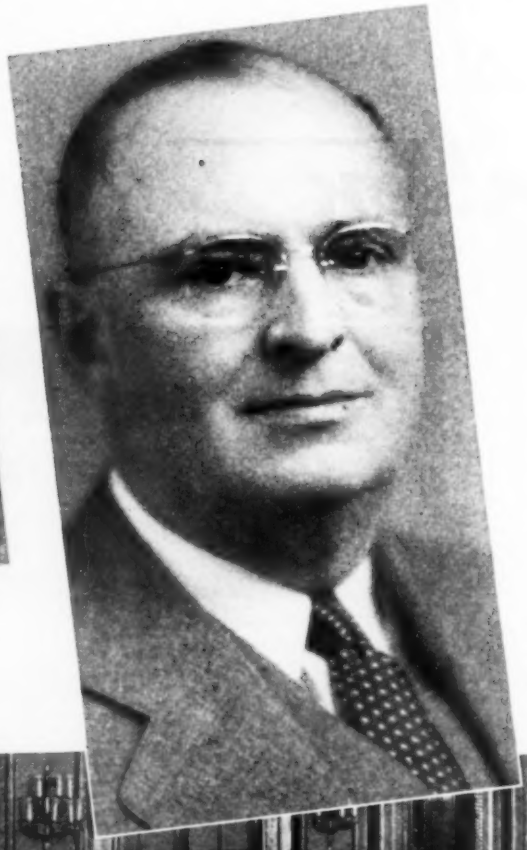
FRED J. WALLS
President



SHELDON V. WOO
Vice President

Scene at AFA ann
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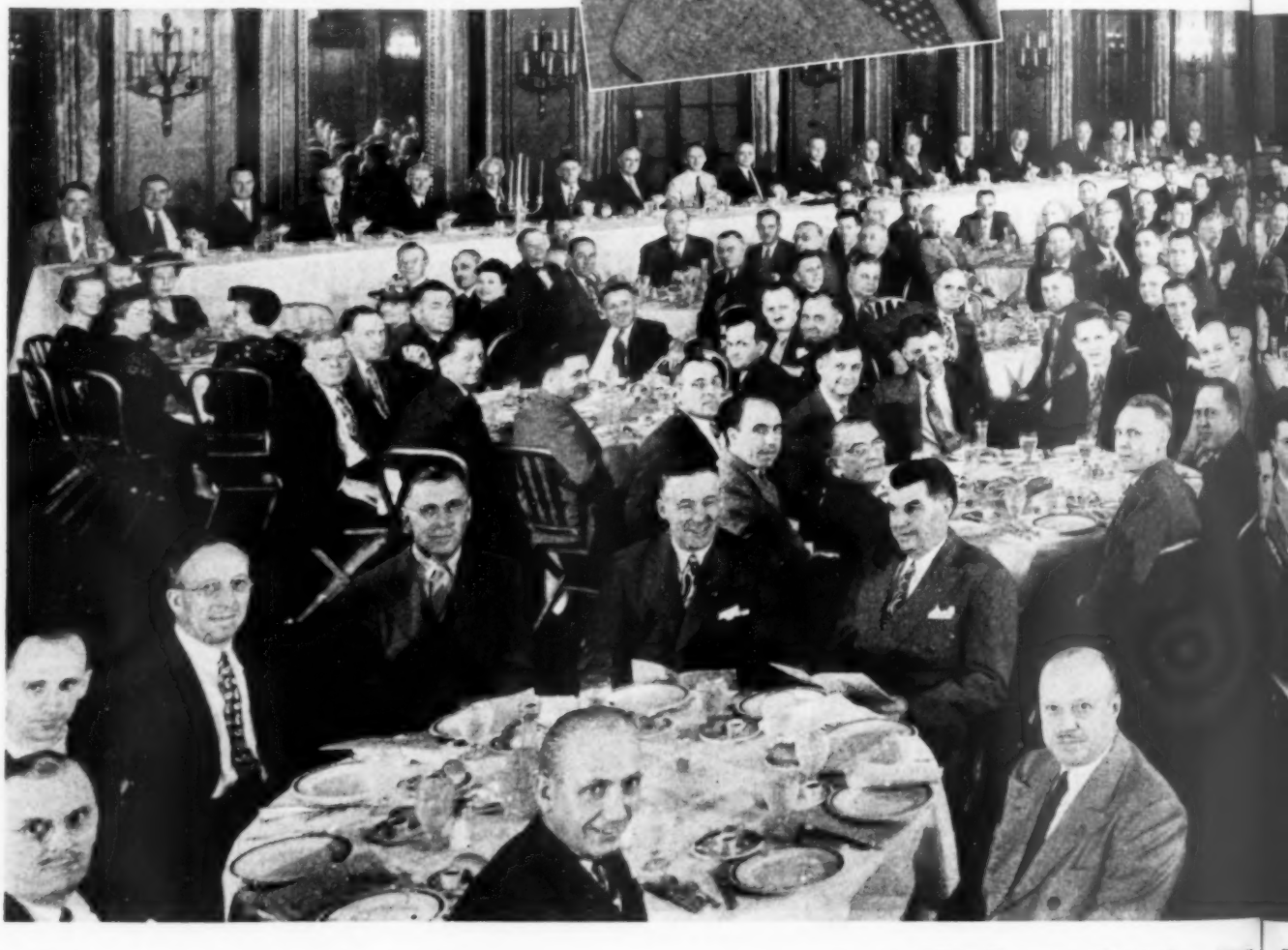


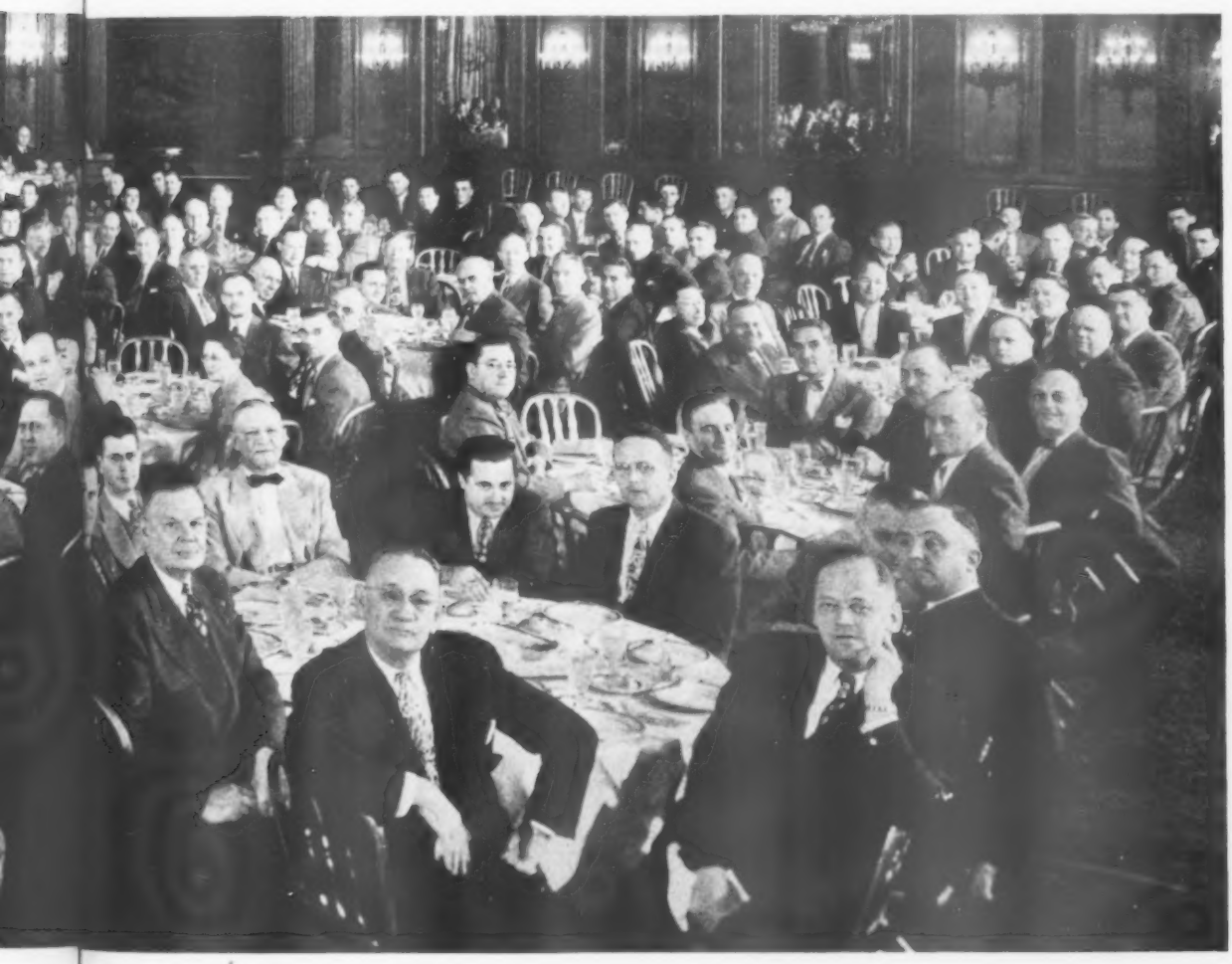
Annual Business Meeting

WAR restraints on civilian travel resulted in cancellation of the 1945 annual convention of the American Foundrymen's Association which was scheduled to be held in Detroit in the spring of 1945. In order to comply with the bylaws of the association which require an annual meeting of the organization, a business meeting dinner was held at the Palmer House, Chicago, July 18. The date of the dinner meeting coincided with the close of the two-day conference of chairmen of the 31 chapters of the association, and the annual meeting of the newly elected board of directors of the association.

The annual meeting of the board of directors was devoted to consideration of ways and means of serving the growing requirements of a constantly increasing membership. The present membership of nearly 8000 represents an all-time high of interest in co-operative foundry action.

In recognition of long and outstanding service with the association as technical secretary and secretary, Robert E. Kennedy was designated secretary emeritus by the board of directors. Bob Kennedy has been active with the association since 1921 and his organization and guidance of technical committee work and chapter activities has played a large part in developing improved practices and processess throughout the castings industry. As secretary emeritus he will continue to play an active part in AFA councils.

William W. Maloney, formerly business manager of the organization, was elected secretary and chief administrative officer of the association. Norman F. Hindle was re-elected director of the Technical Development Program. C. E. Hoyt was re-elected treasurer, and Jennie Reininga was re-elected assistant treasurer. (*Please turn to page* 156)



FOUNDRY RESEARCH At American B

What one large producer of castings is doing to improve foundry practices and develop new products is described in this third of a series of articles on foundry research activities. Previous articles discussed facilities of the Naval Research Laboratory and Battelle Memorial Institute

By WILLIAM G. GUDE
Associate Editor
THE FOUNDRY

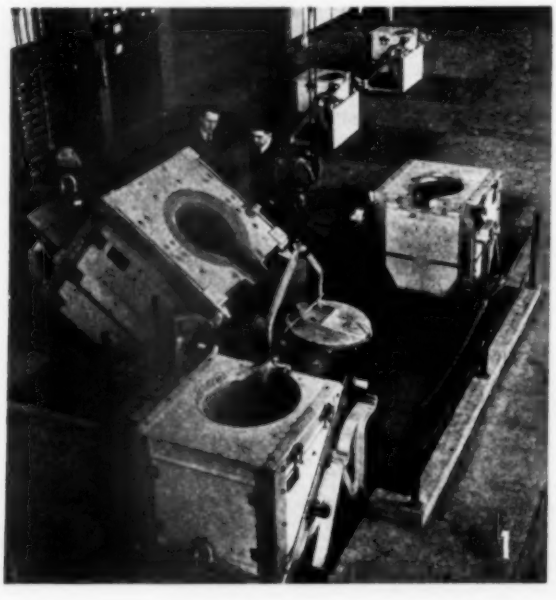
ONE ordinarily associates industrial research and experimental work with laboratories and miniature pilot plants, where products and manufacturing processes are developed on a small scale before being put into commercial production. Because it differs markedly from this usual conception, the new experimental foundry of the American Brake Shoe Co. at Mahwah, N. J., is unique among such facilities.

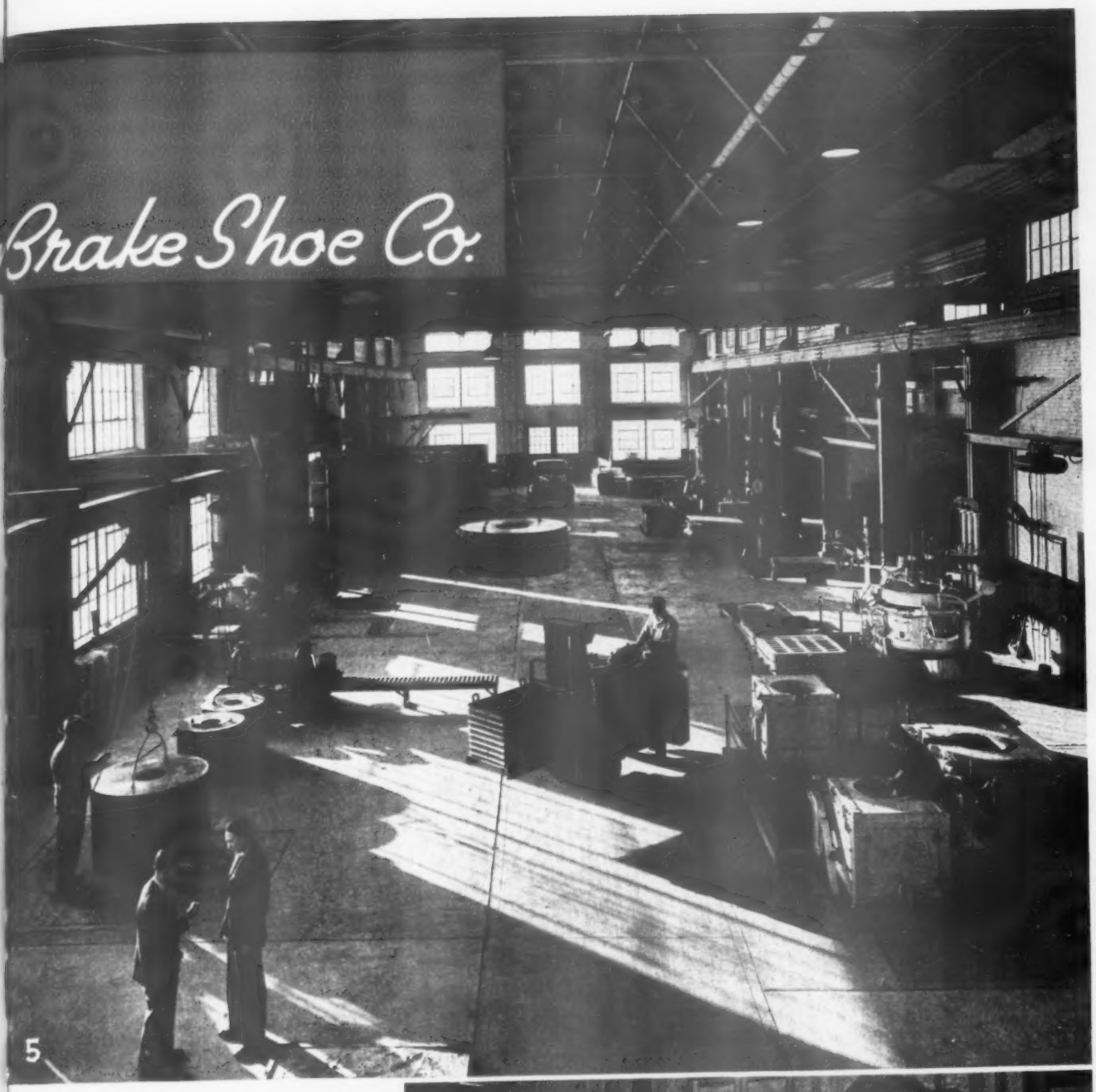
Here is a plant which, in size and in types of available equipment, is not unlike a modern commercial foundry but which is devoted solely to experimental work. Since it is possible for the experimental unit to duplicate many of the operating conditions experienced in the company's approximately 40 foundries, the likelihood of conflict between theory and practice is minimized. As a consequence, the experimental foundry is enabled to turn over its developments in practices and products to the operating divisions all rigged and ready to go.

Cast products of American Brake Shoe Co. are considerably more diversified than is indicated by the name of the parent organization alone, consequently the scope of its castings research activities is relatively broad. Largest of the company's foundry divisions is the Brake Shoe & Castings Division, one of whose 18 plants is located in Mahwah near the experimental foundry. Other divisions producing castings include American Manganese Steel with six foundries, Southern Wheel with nine foundries, National Bearing Metals with seven and Electro-Alloys with its one plant at Elyria, O.

Divisions that do not produce castings are American Brakeblock, American Forge, Kellogg, and Ramapo Ajax. Although brake shoes and car wheels normally bulk large

Fig. 1—Five induction furnaces with capacities varying from 100 to 2000 lb provide the principal melting equipment. Control panel is in left background. Fig. 2—Larger molds and cores are made by machine. Fig. 3—Weight of molten iron poured into vertical centrifugal casting machine is accurately controlled by overhead scales. Fig. 4—Conference room scene shows, left to right: Howard S. Avery, research metallurgist; Earnshaw Cook, chief metallurgist, and Raymond H. Schaefer, assistant chief metallurgist. Fig. 5—General view of main bay of American Brake Shoe's experimental foundry. Adjoining low bay area at right houses molding machines, coreroom, sand conditioner, oven, sand blast, transformer and air compressor rooms





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in the company's total production of castings, less than one-half its sales of all products in the immediate prewar period were in railroad items.

While the company's experimental foundry is intended to have two main objectives—the improvement of existing practices as required, and the development of new commercial products—the war necessarily has subordinated these aims in certain respects to the requirements of the armed forces. War needs, in fact, were responsible for pushing through to completion Brake Shoe's previously conceived plans for a full-size experimental foundry, at a time when the situation in priorities might have been expected to cause postponement of such work. It so happened that early in the war the Army Air Forces were considering the substitution of iron and steel castings for certain forgings, which were in insufficient supply, and approached American Brake Shoe Co. on the idea of doing the piloting work preliminary to the start of production. The proposal was agreed to and resulted in the immediate going ahead with the company's intention of incorporating new and larger experimental foundry facilities in its extensive program of metallurgical research.

To speed erection and conserve new steel, an idle plant located in Kansas City, Kans., was dismantled and 250 tons of structural steel and sash were shipped the 1200 miles to New Jersey to provide the framework for the new building. Connected with the metallurgical laboratory, the new structure consists of two sections—the foundry itself, measuring 196 x 52 ft, and a two-story section having offices on its upper floor and tool room, boiler room and storage space below. Construction work and the installation of equipment required about a year, and the foundry was opened in March, 1944.

The company's research group now consists of a separate engineering laboratory building and the 400-ft long, connecting experimental foundry and metallurgical laboratory structure. The metallurgical portion now includes some space given over to foundry research work before the new unit was built. Main section of the metallurgical laboratory building has general offices and laboratories devoted to creep testing and metallographic work on the second floor, with machine and carpenter shops below. The adjoining two sections include a physical testing laboratory and a sand laboratory on the ground floor, and offices upstairs. A stairway leads from the second floor offices directly to the foundry.

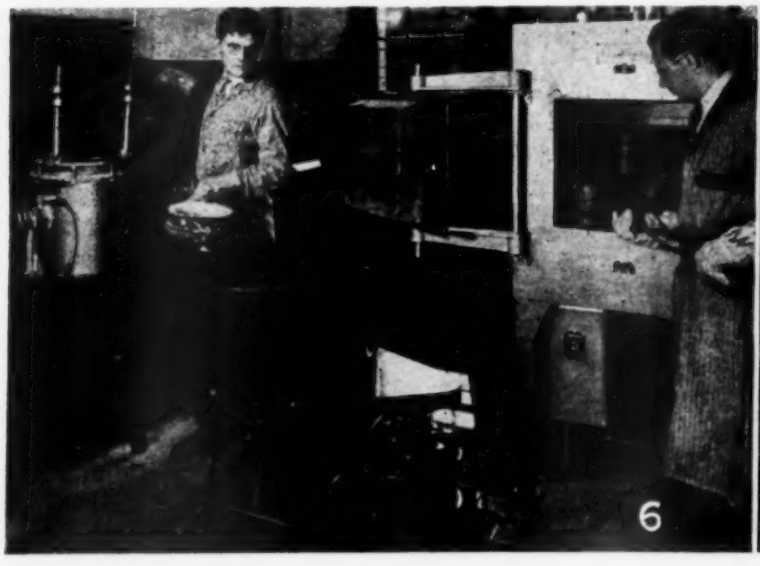
As indicated by the accompanying illustrations, modern full-size equipment is provided in the experimental foundry to handle various operations such as sand preparation, molding, core baking, melting, shaking out, casting cleaning and heat treating. Good illumination and adequate spacing between equipment are apparent in the general view of the 50-ft-wide main foundry bay. Another bay, 26 ft wide, adjoins this area to the right for the full length of the building's foundry section. A large dust collector helps to maintain a dust-free atmosphere, while a concrete floor also contributes to the high standard of cleanliness maintained throughout the foundry.

The foundry is able to handle individual castings weighing a maximum of slightly more than 1 ton. Hot metal is provided by six electric furnaces, including a 1000-lb arc unit and five tilting type induction furnaces of 100, 200, 650, 1000 and 2000 lb capacity, respectively. The three largest induction furnaces are grouped about a pit, as shown in Fig. 1, to facilitate the discharge of metal into the pouring ladle when the furnaces are tilted. The central control panel is shown in the left background. A 330-kva generator, located in a room off the main bay provides power for the melting units.

Numerous cranes have been installed to facilitate transfer of metal, molds, etc. In addition to a 5-ton overhead crane which traverses the length of the main bay, hoists are available on a monorail over the centrifugal casting machines, and jib cranes are conveniently located near the melting furnaces, shakeout and in other departments. A lift truck also is used in transferring materials in tote boxes between departments.

Centrifugal casting machines are located across the

Fig. 6—View of precision casting laboratory during centrifugal casting of investment mold produced by lost wax process. Fig. 7—Sand laboratory activities involve control work for the company's foundries as well as research. Fig. 8—Larger castings are cleaned in this blast room. Fig. 9—Mixer for preparing molding sand has 1000-lb capacity. Fig. 10—Castings ready to enter the high temperature heat treating furnace. Fig. 11—Interior view of mold and core drying oven during charging. Fig. 12—Preparing specimens for x-ray by 200-kv unit



floor from the melting furnaces. These units include two vertical machines accommodating flasks up to 40-in. diameter and castings weighing up to 900 lb, and two horizontal machines of 8 and 15-in. inside diameter, respectively. A relatively large part of the foundry's experimental work on centrifugal castings—and static castings—has been for the Army Air Forces and is largely confidential, although some of the results are included in the restricted report Serial Number W-154, "Steel Castings for Aircraft," released by the Office of Production Research and Development of the WPB. Excerpts from this report provided the basis for the article "Comparative Properties of Cast and Forged Steel," by C. E. Sims, Battelle Memorial Institute, published in THE FOUNDRY for May, 1945. (*Please turn to page* 196)

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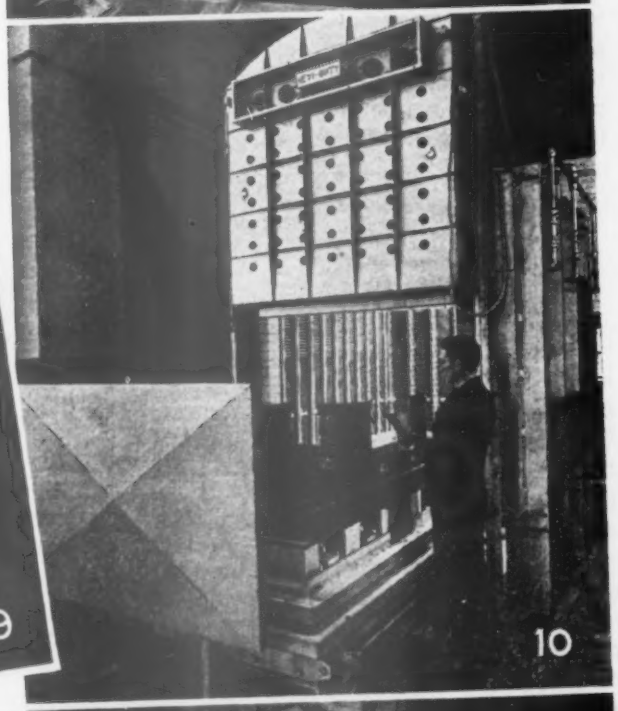
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Mechanization of Iron and

THE term "mechanization" when applied to foundries is generally accepted to mean the full transportation of sand to the molders, of the molds to a pouring station and on to a shakeout and the transport of the shakeout sand back to a sand preparation plant for redistribution. The early installations of plant on these lines in Great Britain were based on experience gained in other countries and were not completely successful. One reason for this was that the British artisan, who had been brought up to take complete responsibility for the production of a finished casting, did not readily adapt himself to the routine repetition necessary with mechanization. Also, full consideration was not at that time given to differences in the materials available and the quantities of castings required in this country compared with those where mechanization was first developed.

Small Foundries Made Over

These early difficulties had some retarding effect on development but in time a better understanding of the problems led to the installation of very successful plants, and in the ten years or so before the outbreak of war many foundries engaged in the production of repetition castings had been completely mechanized. This applied more particularly in the case of iron foundries where quantity production methods had been successful in the manufacture of pipe, automotive components, stove parts, bath tubs, etc. Apart from centrifugally cast pipe where outputs of more than 500 tons per day were obtained, the average production from these mechanized gray iron foundries was of the order of 40 to 50 tons of castings per day. Much smaller plants than these were economically operated; for example, jobbing foundries receiving orders for small quantities of repetition castings had, in some cases, mechanized a section of their plant. Thus, completely mechanized systems, including mechanical and handling plant, mold conveyors, etc., were in some cases laid down for an output as low as 5 tons per day. Continuous metal might be provided in such cases from a cupolette with an output of not more than 2500 lb. per hour.

Many foundries engaged largely on jobbing work had installed mechanical aids so far as these were applicable, power operated molding machines being widely used with and without mechanical sand treatment and handling plant. The average production achieved in these foundries was much lower than that obtainable from completely mechanized systems but was sufficient to secure a suitable return on capital when competing with plants where no mechanical aids were in use. Most of the malleable and steel foundries in the country fell into the second category and few had experience operating completely mechanized systems.

In the early months of the war it became apparent that because of the limited uses to which grey iron could be put in direct munitions production, surplus capacity was available in this section of the industry, while in the malleable and steel sections the need for increased capacity became more and more urgent. To remedy this condition certain gray iron foundries were changed over to the production of components in steel or malleable iron. New equipment was installed to increase production in existing malleable and steel foundries, and new plants were built. The size of the new plants varied according to the type of work it was intended they should undertake from about 20 tons to as high as 200 tons of castings per shift. Most of the castings were needed in large quantities, and be-

BRITISH WARTIME FOUNDRY DEVELOPMENTS

...and Steel Foundries

This is the second group of a series describing wartime developments in the British foundry industry. Articles discussing progress in the iron, steel and nonferrous casting industries appeared in August. A concluding article next month will discuss melting practice

By J. W. GARDOM
John Gardom & Co.
Ripley, Derbyshire, England

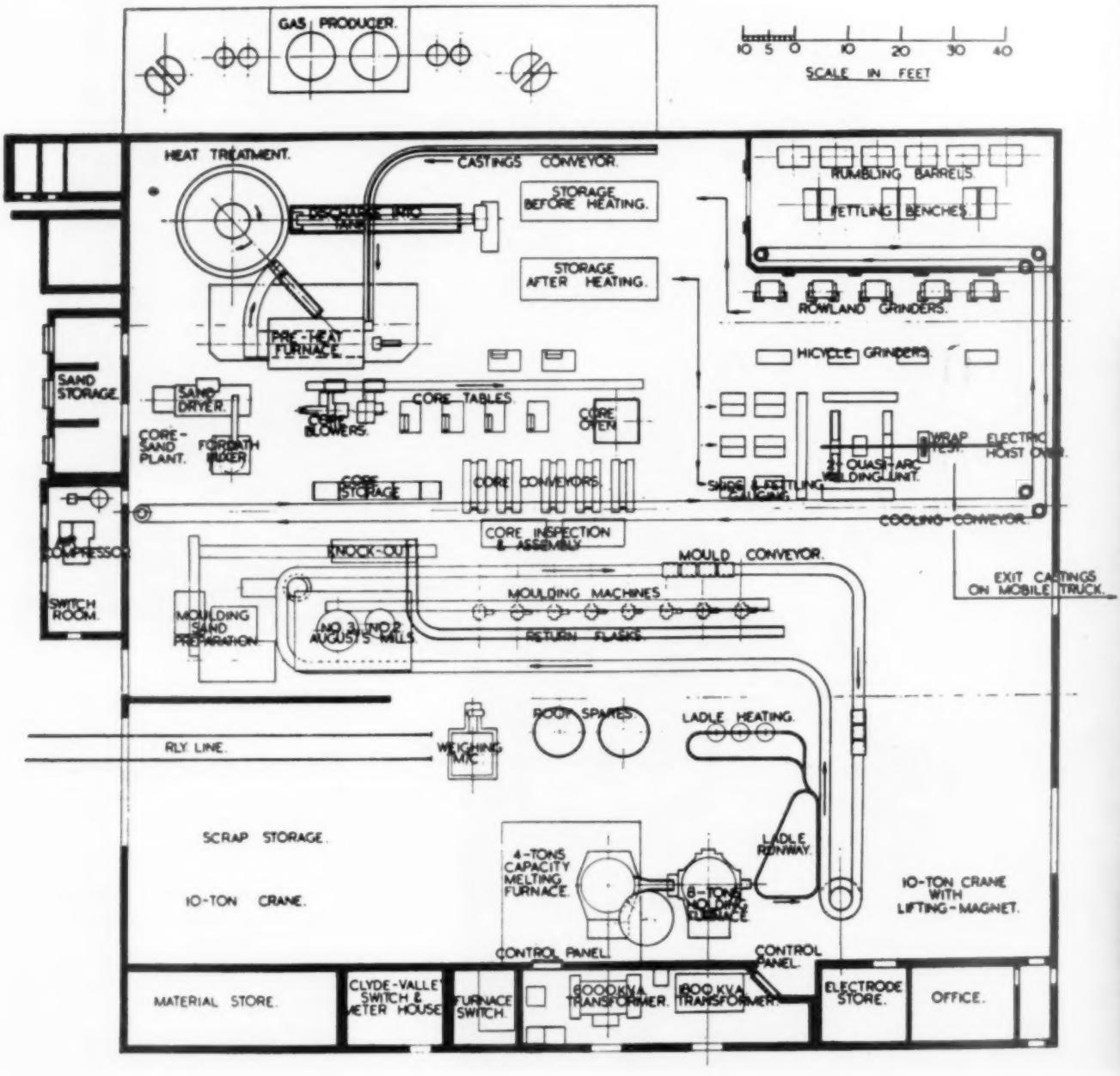
(Above)—Unit mechanization of four machines with mechanically operated sand preparation and distribution plant

(Left) — Women workers pouring molds on roller conveyor in British foundry

cause of this and also because of the shortage of manpower and the necessity for employing unskilled and women labor to a considerable extent, the greatest possible use was made of mechanical aids. Mechanical equipment was also installed in existing plants to increase production.

The equipment used in the new plants generally followed conventional practice. For the lighter castings, machine made molds are brought to a continuous supply of metal by means of power driven conveyors. For larger work, the metal is usually distributed by overhead traveling cranes. A general policy in the design of the new plants was to make these suitable for the production of a particular casting, rather than for the production of castings in a particular metal.

It might be assumed that in the case of a plant which was specially built for the manufacture of one particular casting, arrangements could be made so that the timing of each operation could be synchronized with the next to obtain a steady and continuous flow of work. The analogy of a train of gears has been put forward to illustrate the ideal system of complete mechanization, each wheel representing an operation carried out at the correct speed to mesh in with others and make its contribution to a harmoniously working whole. Wartime experience has not supported this as being practicable and under the conditions existing in a foundry plant, where stoppages can occur from unforeseen causes to a much greater degree than in other mechanized systems, it is apparent that more elasticity is needed than indicated by a train of gears. The most successful plants with regard to production are those where this elasticity was provided. For example, the provision of a large hot metal receiver allows fluctuations in mold production to occur without stoppages at the pouring station. A reservoir of molds between the machines and a power driven mold conveyor is useful in allowing coring and closing to proceed at a steady rate if fluctuations are occurring in mold production, or vice versa. The provision of storage space between pouring and the shakeout, essential where different cooling times must be allowed for different classes of castings, had been found of great benefit, even where only one casting is being produced, in taking up differences in average mold production.



BRITISH WARTIME FOUNDRY DEVELOPMENTS

In the opinion of the author, the mechanized foundry should be like a river which flows continuously and yields a constant output, but contains pools and lakes for storage purposes. The function of these reservoirs is to ensure that whatever fluctuations occur in the rate of flow at different sections from time to time, the quantity produced remains constant.

In plants where the building available or the variety of the castings produced is not suited to the adoption of a fully mechanized system, considerably improved production has been obtained from what has become known as "unit mechanization." The method adopted is suitable for foundries employing a very limited number of molding machines and is capable of unlimited extension. A unit consists of one or more pairs of machines provided with gravity roller track to enable them to be operated as a self contained system. If desirable the sand may be mechanically handled to the machines and removed by conveyor at the shakeout for reconditioning. In the layout shown, the sand at the shakeout is piled on the floor. Water is added and the sand is thrown back to the molding machines by an aerator. If heavy boxes are to be handled, jib cranes with a traveling hoisting unit must be provided near the machines and at the shakeout and if a considerable amount of coring is also necessary a further crane will be needed for closing of the molds.

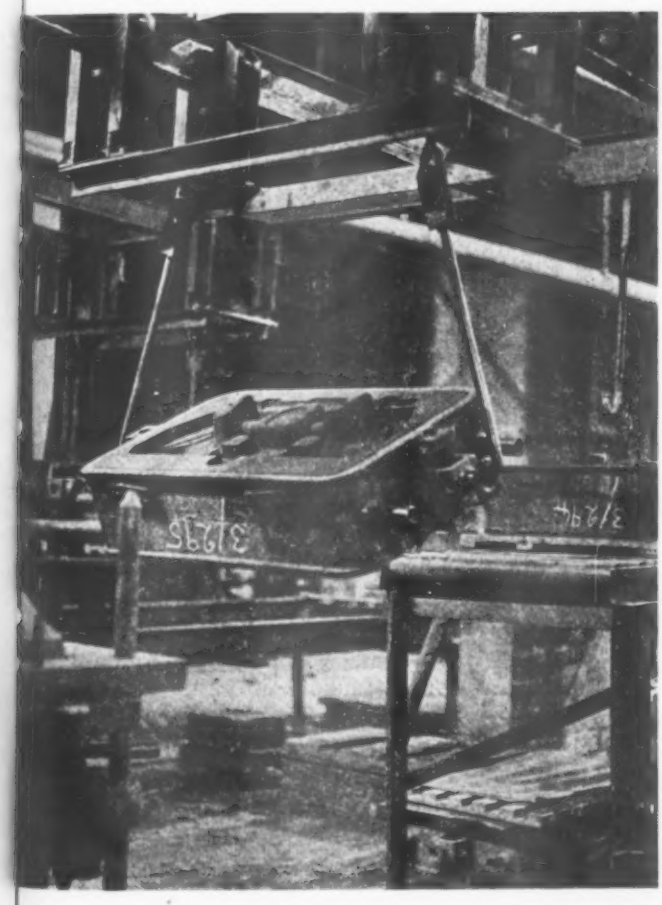
Where a number of these units are operated, the metal is fed to the pouring stations in bogies running on a monorail or rail track. The adoption of this system has led to increases in production of up to 200 per cent compared with pouring the boxes on the floor.

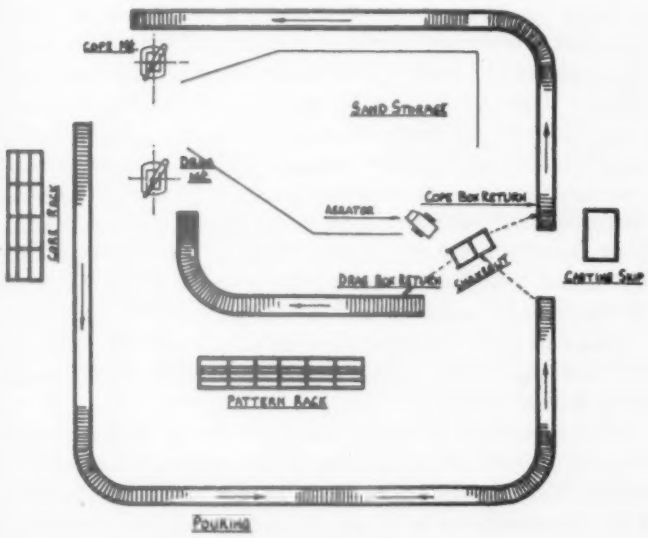
Most of the advances made in mechanization during the period under review have taken the form of special plant design to facilitate some particular operation or to link a series of operations. For example, the use of women labor on molding machines has necessitated the development of mechanical equipment for box handling onto and from the machines and for the transfer of boxes to the mold conveyor. Special items of plant have been designed to ensure correct box closing in the hands of inexperienced labor. Many other small items of plant needed redesigning to meet particular conditions and even the gear ratio used on ladles was modified to make them suitable for handling by women.

Because of the type of labor available it has been necessary to give attention to the design of pattern equipment and the simplification of cores. Extensive use has been made of core blowing machines, and the organization of women into teams where each individual performs one operation has enabled a high production to be obtained on a wide range of complicated cores. Not only have women proved capable of taking on many jobs in the foundry for which they were previously considered unsuited but they have been particularly successful in teamwork.

Mechanization, though it has (*Please turn to page* 191)

(Left)—Layout used for the production of a unit casting. (Below)—Semi-automatic box lift-off and transfer device. (Right)—Layout of a two-machine unit





LAYOUT OF A TWO MACHINE UNIT

By J. G. PEARCE

BRITISH WARTIME FOU

Developments in Research Work

THE TIME has not arrived to deal fully with developments during the war in research for and by the ironfounding industry in Great Britain, but the industry has passed through a great experience in the teeth of almost overwhelming difficulties arising from shortage of labor and of the proper degree of skill, delays in securing equipment and buildings and in a number of cases to various difficulties arising from direct enemy action.

J. G. Pearce, director of the British Cast Iron Research Association, an organized technical body for promoting research and development in the ferrous foundry industry, has held that post since 1924. Educated at the University of Birmingham, Mr. Pearce spent an apprenticeship period with British Westinghouse Electric & Mfg. Co. Ltd. and later assisted in the establishment of that company's research and education department. Mr. Pearce has been an active member of the Institute of British Foundrymen and other technical societies, and has written extensively for these associations.

Many problems were involved in dealing with new products, frequently needing the use of unfamiliar raw materials and in finding substitutes for imported materials due to shortage of shipping space. Nevertheless, despite these, the output both of munitions and of the normal products of the industry applied to war purposes was maintained and even increased over the peacetime figure. These difficulties applied with equal force to the British Cast Iron Research Association. Half of its staff was lost to various branches of the forces, to government departments and laboratories and to industry. As a result of damage to part of its premises by enemy action in 1941, it transferred to new premises 12 miles south of Birmingham during 1942.

The immediate effect of the war was to shut down a certain amount of research work then in progress, due to raw material priorities, but as the war effort became more fully organized the work of the association became more and more devoted to it until, with the exception of a limited amount of fundamental work, the whole of the time and energy of the staff was devoted to the war effort, either on behalf of firms in the industry who were faced with the production of unfamiliar products, mainly to specification, or for various government departments.

The Ministry of Home Security requested the association to form the industry's Anti-Glare Committee and the director became its chairman, and the association provided the secretariat. The object of this committee was to design and foster the design of devices which could be applied to furnaces in the industry which might, during the hours of darkness, be a guide to enemy aircraft. The provision of anti-glare apparatus was compulsory under the Civil Defense Act 1939, but it was possible to obtain a grant towards the cost from the government if the proposed structure was approved by this committee. Only within the few weeks preceding VE-Day was it possible for firms creating glare during black-out to remove these structures, various forms of which became a familiar feature to those working in and around foundries. The various appliances worked extremely well, because the police and civil defense authorities were naturally very severe with those who showed glare.

Following the necessity as the war progressed for economy in fuel owing to the transport and mining situation, the Council of Ironfoundry Associations formed, under a scheme promoted by the Ministry of Fuel and Power, the Ironfounding Industry Fuel Committee, of which the director became chairman, the representatives being nominated by the Research Association and by the Institute of British Foundrymen which provided the secretariat and organized about 14 panels in various parts of the industry to visit foundries and advise on what steps they could take to reduce fuel consumption. By the time the panels ceased active work at the end of March, 1945, they had visited foundries responsible for two-thirds of the total output. The main committee still continues to deal with emergency matters.

Members of the staff, along with a number of those engaged in the industry, also took part in the work of a number of official committees set up to deal with technical matters. Particular mention may be made of the technical advisory panel to the directors (*Please turn to page* 234)

By J. W. GARDOM

Wartime Work of the IBF Technical Committee

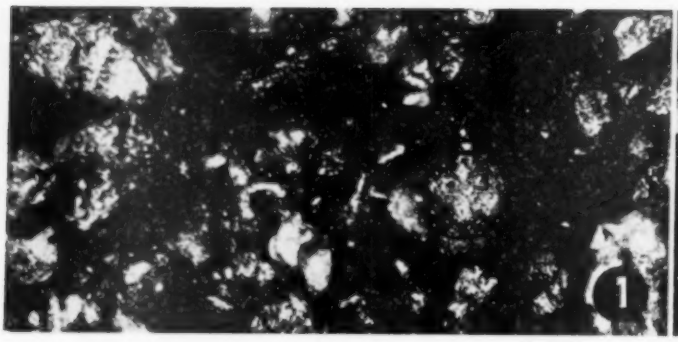
THE Technical Committee of the Institute of British Foundrymen was formed in 1930 to handle all technical matters arising out of the work of the institute. In the original arrangement, members of this committee served on various standing subcommittees according to the work on which they had specialized. Each subcommittee covered a specific field including cast iron, malleable cast iron, steel castings, nonferrous metals, melting furnaces and sands and refractories. In the years before the war much useful work had been completed by the subcommittees in investigating and reporting on subjects of interest to the industry. The reports which they prepared took the form either of papers presented for discussion at the annual conferences of the institute, or of special reports made available to all members. Between 1930 and 1939 more than one subcommittee report became available each year. Total membership of the Technical Committee, which included all members of the subcommittees, numbered approximately 60 and all gave their services voluntarily. The main committee held meetings four times a year and subcommittee meetings were held as and when required.

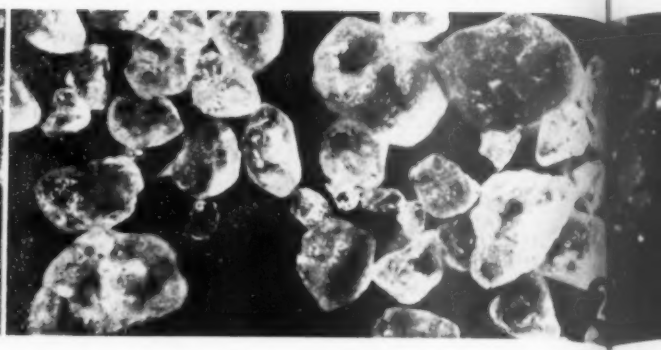
In the early months of the war there was a slackening off in the activities of some of the subcommittees. The chief reason for this was the very heavy pressure of work on technical men throughout the country in dealing with problems arising from the need for new and increased production, which left little time for traveling and attendance at meetings. This phase passed, however, and before long special problems facing the industry were brought to the attention of the Technical Committee and caused a considerable increase in its activities.

Early in 1940 it was necessary to enlarge very materially the facilities available in Great Britain for the manufacture of cast steel track links for heavy tanks. An approach was made by the government department concerned to the Technical Committee of the institute for assistance in the design and equipment of a number of new foundries to make these castings on a mass production basis. The Technical Committee appointed a special subcommittee to undertake this work and it was thus possible to obtain the advice of experts on the various processes and operations which were to be used in the new plants. The personnel of the subcommittee included steel founders with experience in the metals to be used, and also authorities on mechanical handling, molding sands, heat treatment and other processes. A staff of technicians was appointed to work under the direction of the chairman in the preparation of layouts and to assist in overcoming production problems when the plants were started up. The committee took complete responsibility for the layout and equipment of the molding and coremaking sections, sand and mold handling plant, and the sand preparation and fettling departments in these new plants.

At the time that the foundries were being designed, alloy steel castings had never previously been produced in Great Britain on a quantity production basis. Nevertheless the layouts were prepared in record time and all the plants were in production on schedule. It is also gratifying to record that in spite of the necessity for using unskilled and women labor on a scale never previously contemplated in any steel foundry, the production obtained from these plants was extremely satisfactory and in the aggregate exceeded that for which they were originally designed. For security reasons, up to the present little has been published regarding the arrangements used and the operation of these foundries, though the author has described[1] the problems encountered and the methods finally adopted in a pilot plant engaged in the production of similar castings. (*Please turn to page* 230)

J. W. Gardom is well known in the British foundry industry for his work on the Technical Committee of the Institute of British Foundrymen. After serving as convener of this committee for 12 years he resigned in 1944 to take office as president of the institute. During the war Mr. Gardom was responsible for the design and equipment of a number of foundries, both for specialized production and for general castings in steel, malleable, nonferrous metals and iron. He is principal of the firm of John Gardom & Co., consulting engineers of Ripley, Derbyshire.





Reclaiming Core S

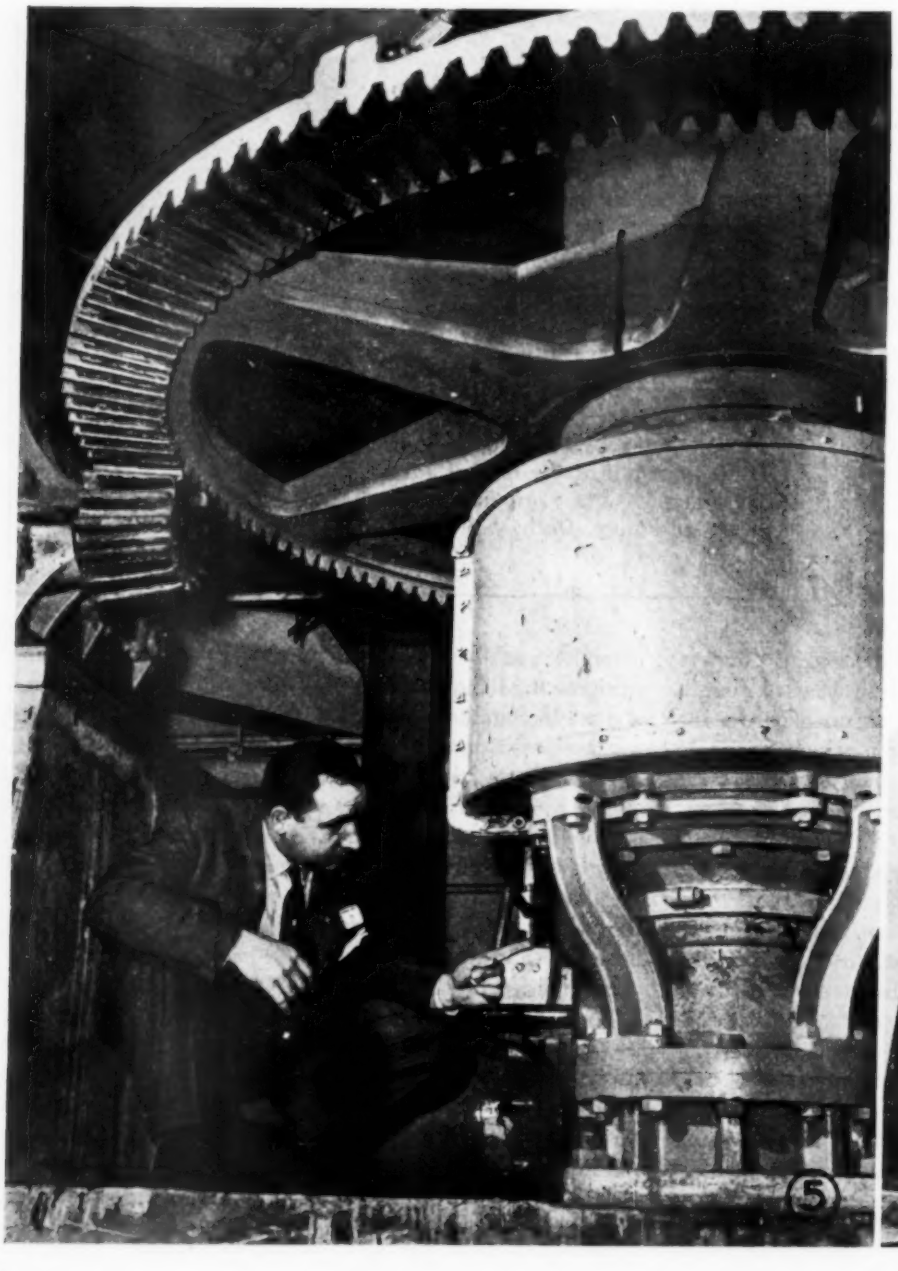
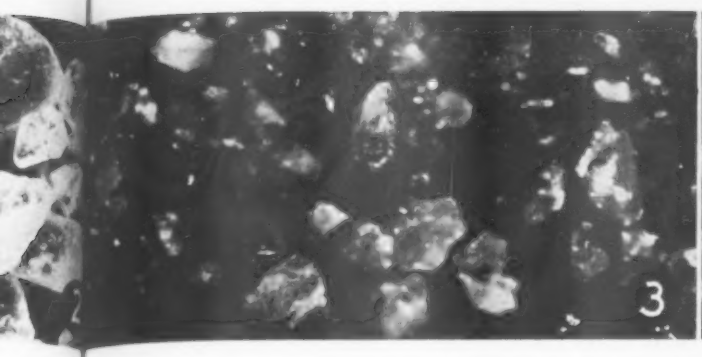


Fig. 1—Sand from the magnesium foundry before treatment.
Fig. 2—After treatment the sand is clean and ready for reuse.
Fig. 3—Sand from the aluminum foundry before treatment.
Fig. 4—After treatment
Fig. 5—Main driving gear for the sand reclaiming furnace showing the wind box through which air is delivered to the hollow shaft
Fig. 6—The complete sand reclaiming unit is housed in one building and is capable of handling the entire sand requirements for the three Wright foundries. Sand from the aluminum foundry reaches the unit on the elevated conveyor which is housed completely to protect it from the elements. Sand from the magnesium foundry is carried to the re-



Sand

By JAMES O. SINKINSON
Wright Aeronautical Corp.
Paterson, N. J.

A NEW sand reclaiming process recently placed in operation at one of the foundries of the Wright Aeronautical Corp., Paterson, N. J., is being observed with particular interest. Under development for nearly four years, this process will be of particular benefit to those foundries which do not have convenient railroad sidings, or are faced with the always difficult problem of disposing of used sand.

With the reclamation system now in use, sand is classified automatically into any one of the various grades required for different purposes. From an economic standpoint, this process is proving very well worth while, since it is eliminating the purchase of between 70 and 80 per cent of the sand which would be required without the process. Furthermore, there is a substantial reduction in the number of men formerly required for handling and trucking new and used sand, and for sorting and recovering chills, wire and scrap metal.

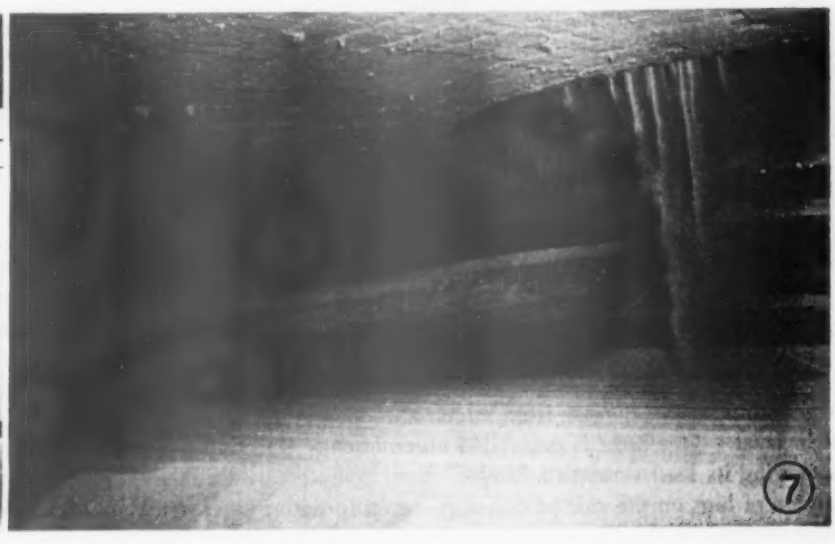
The cost of hauling and handling sand from distant areas has been found to be greater than the original cost of the material, and the difficulty of providing dry storage space for the huge volume required has been a serious problem. By continuous reprocessing, the existing silo capacity of more than 1500 tons and rough sand storage capacity of 500 tons is adequate to assure continuous operation regardless of transportation breakdowns which would normally cause a stoppage of production as soon as stocks became exhausted.

During the severe snow storms of last winter, for example, it would have been impossible to transport sufficient sand to keep the Wright foundries operating, and on one occasion one of the foundries ran for a full month with the addition of only 3 carloads of sand. In the past few years, dumping space around these foundries has become increasingly difficult to obtain, and the company would shortly have been faced with the expense of trucking used sand a considerable distance for disposal. Now, with only a relatively small quantity of fines to consider, the available dumping ground will be sufficient for some time to come.

Sand from the aluminum foundry shakeout, including both the core sand and that from the dry sand molds, is delivered by an underground belt con-

claiming unit on underground conveyors. After crushing, calcining, screening and classifying, the reclaimed sand is delivered to three silos for distribution

Fig. 7—A view looking into one of the hearths. At the upper right may be seen the center discharge hole through which the sand is plowed from the upper hearth, and at the lower left is one of the ports through which it passes to the next lower hearth. The rabble arms are in the rear



Figs. 8 and 9—Manual controls are provided for each item of equipment, but these are interlocked with bindicators so that overflow is impossible

veyor to a 40-ton hopper from which it is picked up by a skip hoist. This hoist is controlled automatically, the skip receiving its load through a hinged chute operated by the action of lugs on the side of the skip engaging with guides on the chute. The hoist discharges into an overhead hopper from which the sand is delivered to a short inclined belt conveyor, where core wires and chills are removed by a magnetic pulley. Some of the smaller wires deeply imbedded in the large lumps may not be caught by this pulley, but will be picked up after crushing. This conveyor delivers the sand to a second belt carried on supports some 30 ft above ground and completely housed in to protect it from the elements. The belt carries the sand across the foundry yard and delivers it to one of the main storage bins. Sand from the magnesium foundry, which is close to the reclaimer unit, is dropped from the shakeout to an underground belt conveyor, which carries it over a magnetic pulley and delivers it to a pit from which it is picked up by a bucket elevator and delivered to the other storage bin. The third foundry is located at some distance from the others, and the sand from that shop is delivered by dump truck into a pit from which it is picked up by an elevator for discharge into the storage bins. Although this trucking may seem expensive, it actually costs no more than hauling the sand to a dump.

From the storage bins the sand is removed by a conveyor and delivered to a bucket elevator which raises it to the corrugated roll crusher situated 65 ft above floor level. After crushing the sand is carried by a belt over a magnetic pulley where all remaining wires and chills are removed, and is then discharged to a 10-mesh screen. The portion which passes through the screen is conveyed directly to the surge bins, while that which does not pass through is delivered to a smooth roll crusher for further size reduction. This material is then passed over a 3/16-in. screen from which it is picked up by a belt conveyor and delivered to a bucket elevator discharging to a screw conveyor which in turn delivers to the two 7½-ton surge bins located directly above the furnace into which they feed by gravity.

System Operates Automatically

The entire system is automatic in operation, and bindicators attached to the surge bins prevent any overflow by shutting down the conveying equipment as soon as these become full, and restarting it as soon as the level is lowered. Manual controls are provided for each item of equipment, but these are interlocked with the bindicators so that overflow is impossible. It is also possible to operate the entire system manually, but when this is done the limit switches remain interlocked so that even on manual control the bins cannot overflow.

The sand handling equipment, including conveyors, elevators, crushers, etc., is capable of handling 25 tons of sand an hour. It is operated, therefore, only about half time, with a resulting reduction in operating and maintenance costs.

The furnace used for the actual calcination of the sand is of the type commonly employed in the roasting of ores. It it 21 ft 6 in. in diameter and 45 ft high, and consists of a vertical steel shell lined with refractory brick containing ten self-supporting brick hearths. Passing up through the center of the furnace is a hollow shaft to which are attached the rabble arms, two arms to each hearth. This shaft is rotated at 2½ rpm by bevel gears and an electric motor, and constitutes the only moving part of the furnace. To these rabble arms are attached the rabble teeth which serve to distribute the sand over the hearth. The arms to which teeth are attached are (*Please turn to page* 222)

Solidification of metals

By DR. HARRY A. SCHWARTZ
Manager of Research
National Malleable & Steel Castings Co.
Cleveland

This condensation by the author of the 1945 AFA Foundation Lecture discusses the basic principles involved in the transformation of metals from the liquid to the solid state. Pamphlet copies of the complete lecture may be purchased through the AFA

Dr. Harry A. Schwartz has been associated with the National Malleable & Steel Castings Co. since 1902, following his graduation from Rose Polytechnic Institute, Terre Haute, Ind. Originally at the Indianapolis plant, since 1920 he has been located at Cleveland as manager of research. The author of numerous articles and papers prepared for technical societies and publications, Dr. Schwartz was the 1931 recipient of the John A. Penton Gold Medal of the AFA, and was awarded the E. J. Fox Gold Medal by the Institute of British Foundrymen in 1939. For many years Dr. Schwartz has been a member of the editorial advisory staff of THE FOUNDRY.

SINCE the foundryman must be concerned with the production of a piece of metal having a desired form, free from injurious voids and of a proper structure, by pouring liquid metal into a mold and allowing it to freeze, the subject of "Solidification of Metals" should be of fundamental interest.

The basic principles fall naturally into three fields: Crystallization of solids from the liquid state, thermal properties of the materials involved, and flow of heat through solids and liquids.

All metals solidify by building crystals. In this process atoms of metal in a liquid occasionally reach, by chance, such relative positions as they occupy in the solid state. If the temperature condition is favorable, nuclei grow by adding layers of atoms in a perfectly regular arrangement until, finally, adjacent crystals meet and no liquid is left.

Except for pure metals and eutectic alloys, freezing does not take place at a single temperature, but over a range of temperatures, and the metal first frozen is, in general, purer than that which remains liquid longer. The laws covering equilibrium between two or more phases are quite adequately understood as the work of that greatest of American scientists, Josiah Willard Gibbs. Under commercial conditions, equilibrium is seldom attained and departures from the expected behavior may be encountered.

Among the physical properties, we are concerned primarily with density, specific heat, and thermal conductivity, all as functions of temperature, and with the heat given off or absorbed when a metal changes its state, for example, when it freezes or melts.

For the purpose of calculating heat transfer, the density, specific heat, and thermal conductivity are frequently used in the form of a derived constant, "diffusivity," calculated from the three. One also must be interested in the properties of liquids which influence their flow, viscosity, and surface tension.

The fundamental principles of heat transfer were first systematized by the famous Napoleonic mathematician, Fourier. The basic assumption that heat flows across a given plane in a body at a rate proportional to the temperature gradient at that plane is childishly simple. Its mathematical application to the cooling of bodies is made by a process invented by Fourier for this purpose, and may become extraordinarily complicated. Various expedients, mathematical, graphical and electrical, have been devised to simplify the treatment.

The foundryman wishes to control solidification in such a way that "voids" no matter why they form, can be filled by a further supply of liquid metal. The fundamental principle is that solidification shall begin furthest away from the last remaining source of liquid and progressively approach that point. This means that freezing shall take place toward the feeder, a process referred to as controlled or progressive solidification.

Unfortunately, one cannot furnish a rigid treatment of the subject from this practical viewpoint. However, it is possible to explain the scientific principles to be considered in securing the desired ends. In such a discussion, it is necessary to make simplifying approximations which clarify our understanding without making the conclusions inapplicable to actual cases.

In the published paper, the various principles to be considered are described in some detail and are rather completely illustrated. Most of this detail and all the illustrations must be omitted and only the principal fea-

tures described in the abstract to be presented here.

The number of nuclei from which solidification takes place depends primarily upon the cooling rate through the melting point or melting range. Since each nucleus grows to a crystal, the grain size of the frozen metal is largely determined by this freezing rate. Rapid cooling makes for fine grain, and vice versa.

All crystalline substances have a property which is called "linear crystallization velocity." This represents the rate at which the solid substance can build layers of atoms upon its surface. Surprisingly enough, this velocity for a given substance is not greatly variable with temperature.

Since crystals can grow only at a rate fixed by this velocity, the rate at which heat can be given off when a metal freezes is not unlimited. It therefore is quite possible, by the use of metal molds or chills, to absorb heat so rapidly that the metal remains liquid below its normal melting point. The more it can be super-cooled, the greater the number of nuclei which can survive and build a grain of the frozen metal.

During selective freezing, especially, solidification does not take place by the growth of simple geometrical shapes; instead, these crystallites grow in certain preferential directions, often forming dendritic or tree-like patterns. Such branching growths may entrap liquid metal within them which becomes entirely isolated from any further supply of liquid and leaves a shrinkage void of microscopic size, or a porous shrink, as the case may be, in the casting.

Metal very rapidly cooled at its surface often grows into columnar structures perpendicular to the surface of the casting, all the heat which is abstracted being supplied by the freezing of metal at the ends of these columns while the liquid metal remains sufficiently hot so that no nuclei are distributed throughout its mass. This process is facilitated if the thermal conductivity of the solid metal is much higher than that of the liquid.

Few commercial metals are not alloys of more than one element. The liquid always contains all of the elements present, and the solid usually contains more than one. Almost invariably, at any given temperature, the solid and liquid, if in equilibrium, are not of the same composition.

There are but few cases where liquid metals are not soluble in each other in all proportions. In the solid state, solubility may be practically absent, it may be limited, or the solid elements may be soluble in each other in all proportions. The case of limited solubility is the most common.

Why solid solubility does, or does not exist, is related fundamentally to the crystalline structure of the metals and to the architecture of atoms in terms of protons and electrons. One of the simplest of statements applicable in this field is that solubility can be unlimited only between elements whose atoms are within about 15 per cent of the same size, and whose (*Please turn to page* 210)

MAN-TO-MAN *on the Molder's Bench*

By RALPH L. LEE

WHILE speaking of jobs with Johnny Cochrane at his little foundry in Pennsylvania, he told me the second day that last winter during the heavy snowstorm that tied everything up in the East, two of his molders and a shakeout man who were sharing the ride home after work were about half-way home when it started snowing so hard they could barely see the front of the car. One of the boys said, "If this keeps up we won't be able to get back to work in the morning." And said another, "I've got some molds out on the floor that have to be poured in the morning." "So have I," said the third.

So, according to Johnny, what did this trio do when they finally got home but eat their suppers, pack their lunches for the next day, turn right around and head for the foundry again. Later, when Johnny introduced the three to me, I asked them where they slept that night. They told me it was on gunny sacks on the pattern shop floor and that none of them would be the same again. In fact, they expected to sue Johnny any day now.

Johnny Cochrane's little old-fashioned foundry is holding its own and better against the stiffest kind of competition of much larger plants—conveyor-equipped plants in which the sweat of shoveling, lifting and toting has largely been done away with. So it begins to appear that whatever it is that enables Johnny's gang to meet such competition can hardly be measured with the stop watch.

To my way of thinking, it's a matter of feeling—the feeling of pride in belonging to a gang that has a reputation to keep up—a reputation of doing damn good work and a lot of it.

If this is true, and I believe it is, then the feeling of pride in "belonging to the gang" is destined to be the bottleneck of production which no amount of time study, progressive processing or labor saving devices will open. This feeling of wanting to get on the job and get it out has to be developed on the basis that everyone in the place is recognized as an important member of the gang who really and truly belongs.

Britain's *Volcano* Bomb

FOR the past five years or more, the incomparable Gracie Fields in her concerts on many occasions has included a number describing a most remarkable household plant. The closing line delivered with all the musical and dramatic force of which Our Gracie alone is capable, "We'll 'ang ol' 'Itler on the'ighest branch of the biggest Aspidistra in the world," never fails to bring a wildly cheering audience to its collective feet.

The foregoing represents natural and highly commendable wishful thinking. During the same period Barnes Neville Wallis, Vickers-Armstrong Armament Co., designed and developed an 11-ton aerial bomb which—landed accurately—would blow everything in the vicinity to—well, out of existence. The purpose of the 11-ton bomb is to smash targets hitherto considered indestructible. On March 14, the first bomb dropped on the massive Biefeld viaduct in Germany wrecked at least six spans, and it subsequently proved equally effective on other targets.

This bomb, known as the *Volcano*, although ten times as powerful as the German V-2 rocket, is relatively insignificant in its destructiveness compared with the atomic bomb recently loosed upon Japan. Nevertheless, details of its production are interesting. (*Please turn to page* 178)

Fig. 1—(*top*)—*Cores for the* 11-*ton bomb preparatory to being lowered into the mold*

Fig. 2—(*right*)—*Placing core in mold. Bomb casting mold is made upright in an octagonal flask in a pit*

Fig. 3—(*below*)—*Initial step in making the core. Rope made from wood shavings is wound around the framework, later coated with loam*

Eliminating Troubles in CASTING BRONZE

The author discusses factors to be watched in overcoming some of the principal problems encountered in bronze and aluminum founding. This article is from a paper presented at a meeting of the Saginaw Valley Chapter of the AFA, April 4, 1945

INGOTS should be stored in a clean dry location. Our experience is that by keeping our ingots dry and clean and providing the ingots have been pigged properly, the metal will be substantially free of hydrogen up to the melting operation. The same precaution applies to all the alloys in which you are dealing with scrap remelt metal and that is to be on guard against contamination of alloys. Chief difficulties which can arise during the melting and pouring of copper base alloys are as follows:

1. Gas Porosity—This condition is caused by improper fluxing, additions of metal after the original charge is molten, allowing furnace flames to impinge directly upon the charge and holding molten metal too long before pouring.

2. Melting Losses—In order to be sure that melting losses do not impair the ultimate composition of the metal, it is very important to know the composition of the metal before starting, in order that proper allowances may be made for melting losses of low temperature ingredients in the alloy. We purchase bronze ingots prealloyed to our own specifications and usually the only addition we make is an ingredient that is too close to minimum specification.

Eclipse-Pioneer foundries use graphite or silicon carbide crucibles for melting and pouring. We use charcoal, glass or silica sand as a covering and make certain that the charge is continuously fed until all the metal is completely molten. No additions are made in any crucible after the metal is molten, because of the danger of gas absorption due to disturbance of the molten metal.

We pour our bronze at temperatures ranging from 1860 to 2200 F and we use phosphor-copper shot as a deoxidizer after removing the crucible from the furnace. We use 2 to 3 oz per 60-lb crucible. After this deoxidizer is dissolved, we skim the metal and pour. Our practice with manganese bronze is to flare it for 5 to 8 minutes before pouring. In the actual pouring of the bronze alloys, the proper skimming of oxides and dross is necessary and as usual with all pouring, the closer the pouring lip of the crucible to the mold sprue, the better the results.

Where gas or oil furnaces are used, control of furnace atmosphere is important. A slightly oxidizing atmosphere is desirable unless you can control it so well that you have an absolutely neutral atmosphere. You will sacrifice pot life by having a slightly oxidizing atmosphere, but you will get a good pot of metal. Furnace atmosphere is controlled by fuel and air mixture. A good practical test for furnace atmosphere is to thrust a strip or slab of pure zinc into the furnace flame. If it turns black, there is a reducing atmosphere. If it remains clear or silvery, the atmosphere is neutral. If it turns yellowish the atmosphere is slightly oxidizing.

Chief difficulties encountered during the pouring and melting of aluminum alloys are as follow:

1. Gas Porosity—Caused by molten metal held too long after pouring temperatures have been reached. Im-

proper fluxing, overheating metal and various small but important causes such as bridging ingots in the melting pot, improper stirring and damp flux.

2. Iron Contamination of the Melt—Caused by improper cleaning and painting of iron pots, pyrolances, pyrometers, ladles and stirring rods.

In general, gas porosity is encountered in the aluminum alloys having magnesium content more often than in the other aluminum alloys. Always keep in mind that molten aluminum reacts with moisture to form aluminum oxide and hydrogen. Hydrogen means gas porosity. So beware of moisture in any form.

We believe that without exception, any type of aluminum casting can be poured between the temperature ranges of 1260 and 1400 F. This effectively controls one source of gas porosity, overheating of metal. We try, if at all possible to avoid holding metal at pouring temperature too long because this delay allows metal to absorb gas. Also metal held at elevated temperatures has a tendency to increase in grain size.

It seems that no matter how well fluxed the metal is and how well the flux cover is maintained, it is fatal to allow a pot of molten metal to stand for any length of time at elevated temperature. The only way to avoid this is, of course, to have the molds ready and waiting for the metal. If for some reason we cannot avoid holding metal and we find it has absorbed gas, we pig it and remelt. If we have any doubt about a pot of metal for any reason whatsoever, we pour a testpiece from the metal, machine it and examine it for gas porosity. This takes about 8 minutes and is a very effective way to check doubtful metal.

We find that the next biggest reason for gas porosity is improper fluxing methods. Fluxing should begin as soon as melting of metal starts. As soon as the last portion of unmelted metal disappears below the surface of the molten metal, an immediate and complete covering of flux should take place. The metal is then brought up to about 1300 or 1340 F depending on the pouring temperature. Flux is then stirred in properly with a stirring rod. Then flux is skimmed off and the metal is poured. The average furnace will rise 50 to 60 F after shut off.

Another source of gas porosity which comes under the heading of bad foundry practice in the bridging of unmelted ingots in the melting pot. When ingots are bridged, you do not get a continuous melting of metal and, therefore, metal that is already melted is being overheated above the required temperature, thereby contaminating the already molten metal to a point where a whole batch would be worthless. Ingots should be placed in a perpendicular manner, so when bottom ingots are melting, the top ingots will follow through.

Iron contamination of aluminum alloys is caused by the following conditions:

1. The presence of screens, nails, core wire, iron chills and other foreign matter in scrap metal. It is certainly worthwhile to maintain careful control of scrap remelt metal to eliminate this source of contamination.

2. Because iron is very soluble in molten silicon, which is an ingredient of the aluminum silicon alloys, the best way to prevent iron contamination is to prevent these alloys from coming into contact with iron. This means positive and effective cleaning of iron pots or the use of refractory or graphite crucibles. If iron pots are used, a good protective coating must be used to cover every part of the pot and the coating must be thick enough to be effective. We use a mixture composed of 1 part sodium silicate, 6 parts mica wash and 8 parts water. Pyrometer tips, stirrers, ladles and any other iron instrument (*Please turn to page* 162)

AND ALUMINUM

By ANTHONY CRISTELLO
Foundry Manager, Eclipse-Pioneer Division
Bendix Aviation Corp., Teterboro, N. J.

QUESTIONS and

Determine Phosphorus Content

Q.—We are having difficulty in determining the exact percentage of phosphorus in a bronze which has to be held within the range 0.20 to 0.30 per cent. Have you any suggestions on a suitable procedure?

A.—A common method for the determination of phosphorus in bronze which gives concordant results with proper technique follows: Dissolve 1.0 gram of sample in 20 cubic centimeters hydrochloric acid (1-1) and 10 cubic centimeters nitric acid (1-1) in a 30 cubic centimeter ehrlenmyer flask. Evaporate until salts begin to crystallize. Dissolve in 30 cubic centimeters of water and add 40 cubic centimeters nitric acid (1-1). Heat to boiling, add 50 cubic centimeters ammonium molybdate solution, and agitate vigorously for 25 minutes or longer. Filter and wash the precipitate on the filter 6 times with acid ammonium sulphate solution.

Dissolve the precipitate from the filter with ammonium hydroxide (1-1), catching the filtrate in the original flask. Wash filter with water. Add 10 grams zinc (20 mesh) to the solution, and then 50 cubic centimeters sulphuric acid (1-1), and allow to stand on edge of hot plate at 180 degrees Fahr. for 20 minutes. Filter through a plug a cotton and titrate with standard O.1N potassium permanganate.

Ammonium molybdate solution is composed of 55 grams ammonium molybdate, 50 grams ammonium nitrate, 25 cubic centimeters concentrated ammonia, diluted to 1 liter with water. Acid ammonium sulphate solution is made with 2000 cubic centimeters water, 30 cubic centimeters concentrated ammonia, and 50 cubic centimeters concentrated sulphuric acid.

Has Several Problems To Meet

Q.—We are making pistons, cylinders and crankcase housings for small refrigeration compressors, and are having difficulty in obtaining a desired hardness of 200 brinell with plain cast iron, and at the same time obtaining reasonable machinability. In addition the finished surfaces are not as good as we desire. We have considered the possibility of heat treating those castings but do not have the facilities for doing this work in the required volume.

A.—The particular problem is not to obtain a machinable iron, or even a close grained iron, but to secure 200 brinell together with machinability in light castings. Ni and Cu were particularly effective in that they prevent danger of chill, yet do not promote rapid breakdown of carbide at and below the pearlitic transformation. In other words, they have both a softening action (preventing chill) yet harden the matrix and either do not promote or prevent the formation of much soft ferrite—as high Si content is very likely to do. In the presence of high Si, brinells around 170 and 180 are quite likely.

Maintaining TC 3.30 per cent or under and the use of inoculants are suggested for trial. Inoculants include various Si bearing materials (ferrosilicon, calcium silicon and a number of proprietary compounds) and C or graphite. If the composition is such that a slight mottle is obtained in the lightest sections, the addition of an inoculant will prevent chill, also it will promote precipitation of graphite in such form that free ferrite formation is less likely. The use of inoculants demands timing, as their effects wear off after a brief period.

Unfortunately foundries cannot always get suitable pig iron today, and this introduces another variable. Your problems really demand the help of an experienced metallurgist, and very rigid control and followup. As a first step it is suggested that you get in touch with a firm making inoculants (several of whom advertise in THE FOUNDRY) and submit your problems to its technical expert. Heat treatment is a possibility, but involves a number of complications, including a double treatment.

Test Bars Not Fed Properly

Q.—We are having difficulty in making test bars of the 85-5-5-5 alloy to meet the required 30,000 psi. tensile and 20 per cent elongation minimum. We have elongations varying from 11 to 40 per cent and we note that bars with low elongation are copper colored in center and while those high in elongation have a gray fracture.

A.—The gray fracture of course is the correct color for the composition you are casting. The copper color arises from the lack of feed, or in other words the inability of the riser attached to the bar to supply the necessary fluid metal as the crystals grow. The correction for this is not increase in temperature. In fact the temperature being used now is rather on the high side, and therefore, indicates the possibility that you are exposing the metal to an excessively long time in the furnace in order to reach superheat.

Excessive exposure of the metal to furnace gases is of course a dangerous thing and may result in gas absorption which in itself will retard seriously the feeding process of the riser and produce a copper colored fracture. To correct the trouble with these bars, arrange the gates so that feeding will take place definitely. This is done by making a sizable gate connecting the sprue with the end of the bar and if necessary with the end of the riser as well.

We presume the standard design of the Navy bar which you mention is that in which the bar is cast to shape with allowance for machining to size and is attached along its entire length to a riser by a web of at least 3/16-in. thick. This web should be filletted well at its junction with the bar and also with the riser. The design shown in the standard sketch attached to the Navy specification indicates a fillet but sometimes it is better to increase this fillet by the addition of a little wax to the pattern along the junction point of the web and the riser.

Be careful to have the metal in the test bar run slightly uphill if you want the best results so there is no tendency to wash back and forth and cause an excessive cooling at the long points first. Watch your melting practice and be

Sand ANSWERS

careful about the size of the web connecting the bar with the riser. Be sure that your riser is full size as shown in the drawing supplied by the Navy Department and that the riser is above the test bar so that gravity will help the feeding process. You should then have very regular results from tests and if your chemical analysis is correct you should exceed the minimums required in the specification by an ample margin at all times.

Changes in Melting Practice

Q.—We are having trouble with keeping the tuyeres of our cupola clean, and must poke them every two hours. We would like to run the cupola for 8 hr with one cleaning if possible. Data on present practice are—48-in. lining, 8 hr continuous heat, 40-in. bed height (beehive coke), 69 lb limestone and 3 lb fluorspar per charge, 1400-lb metal charge containing 50 per cent pig iron, 7½ to 1 iron to coke ratio, 6 tons per hour melting rate, tapping temperature 2650 F, hand charged. Present tuyeres are 25 per cent of cross-sectional area. Air weight control for blast is set at approximately 2900 cu ft with a back pressure of 11 oz. Lining extends 2 in. over tuyere plates and tapers back to 48-in. lining about 2½ ft above tuyeres.

A.—The normal melting capacity of a 48-in. cupola is between 9 and 10 tons per hr. To attain this melting rate the volume of air, coke and iron must be proportioned properly. Thus your present supply of 2900 cu ft per min is not quite enough for a delivery of 6 tons per hr and is far short of 4500 cu ft per min required to melt 9 tons per hr. You do not state whether the 40-in. bed means 40 in. above the sand bed or 40 in. above the tuyeres. If the latter, it is too low. The 65 lb of limestone and 3 lb of fluor spar are sufficient, if the limestone is high quality. You do not state if the cupola slags freely or not. The slag must run freely, especially on a long heat. Therefore, it may be wise to make any required changes in fluxing.

The tapping temperature, 2650 F, is too low for light castings, unless you catch the metal in hand ladles at the spout. A low bed, heavy iron charges and thick splits of coke probably are responsible for the black tuyeres. We suggest you change your practice as follows: Raise the bed to 48 in. above the tuyeres, place 1000 lb of iron and 125 lb of coke on each charge. Light the fire early and let the contents of the cupola soak in the heat for about an hour before putting on the blast. If 6 tons per hr meets your requirements, your present blast equipment will serve. If you want to raise the delivery up to capacity, you will need a blower capable of delivery 4500 cu ft per minute.

Steel Will Improve Structure

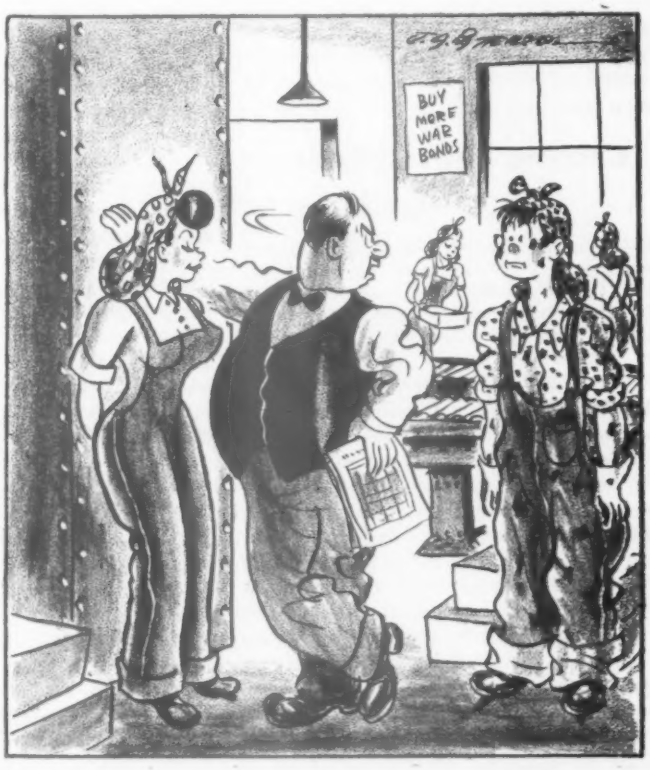
Q.—We have an order for so-called semisteel castings which weigh approximately 57 lb, and are 2 ft long, 4 in. wide and 4 in high, with a metal thickness ranging from ¼ to ⅜-in. The metal will not be tested, and the strength is not an important factor since the castings are rope chocks or rope guides. Can you tell us what a suitable composition would be for those castings?

A.—Steel scrap is added to the cupola charge to reduce the carbon content and thereby improve the structure and consequently the strength of the resulting castings. The amount of steel may vary from 5 to 90 per cent depending on the physical properties desired in the casting. The general subject presents so many ramifications that any brief discussion would be of no practical value.

Your present problem may be solved readily and to the satisfaction of your customer by adding steel scrap to your regular iron and pouring into the castings which are not subject to any form of test, chemical or physical. From your knowledge of iron and the purpose for which the castings are designed, you are quite certain they will serve satisfactorily. Analysis might vary to a considerable extent without impairing the value of the product. Typical analysis will show approximately: TC 3.50 per cent, Si 2.25 per cent, Mn 0.60 per cent, S under 0.10 per cent, and P 0.40 per cent. Addition of 10 to 15 per cent steel scrap in the charge with adjustment of the other components to bring the analysis within the suggested range, should meet the requirements, and undoubtedly will give a somewhat stronger casting than a straight pig and scrap mixture, due to dilution of the carbon. With that small amount of steel no difficulty should be encountered.

GANGWAY!

By J. A. Patterson



"Yes, Yes, I know, Miss Twittle—You're the one the production manager sent me back here to see in regard to a promotion."

Producing Hard Face on Gray Iron Casting

Q.—Can you give us information about a material which can be painted or sprayed on sand molds to make certain parts of gray iron castings hard and resistant to wear and abrasion?

A.—To accomplish the purpose you have in mind there are two possibilities. One is to face the desired portions of the mold with some material which has a greater conductivity than sand, and hence, will act as a chill. The other method is to apply some material to the mold face which will alloy with molten iron producing a hard, wear resistant skin on the casting. However, we doubt whether either of those can be achieved through just painting or spraying the mold face.

Standby of the oldtime foundryman to insure more rapid cooling of the mold in certain portions without resorting to metal chills was to mix castiron borings with the molding sand, and use that for facing. Silicon carbide sand also has been used to obtain a similar effect; latest addition to materials with high thermal conductivity is zircon sand (zirconium silicate) which is applied as a facing about 1/8 to ¼ in. thick at the desired point.

Second method mentioned whereby a hard alloy skin is produced on the casting is to spray the mold face at the particular area with some type of adhesive such as thin clay wash, sulphite liquor, ethyl silicate, etc., and then sprinkle preferably through a fine mesh screen or sieve, a layer of powdered ferrochromium. The mold face is dried by any suitable procedure to remove excess moisture before pouring in the iron. The latter should be good and hot to insure absorption or solution of the ferrochromium which will result in a hard, wear resistant skin.

Casting Thin Cylinders Centrifugally

Q.—We are interested in the prospect of making some light and comparatively thin brass cylinders on a production basis by the centrifugal process, and would like to have the names of manufacturers of equipment, articles on the subject, and any other information.

A.—While centrifugal casting has many advantages, and would probably be ideal for producing the cylinders you mention, we doubt seriously that you will be able to accomplish what you have in mind; that is thin-wall tubes or cylinders. Reason is because any slag, dross or dirt entering the mold with the metal is thrown into the center or bore of the casting, and must be removed by boring or turning. Similarly a cut is taken on the outside diameter as the as-cast may not be entirely satisfactory. Zuehlke mentions that machining allowance of 1/16 to 3/32 in. for machining on a side for exterior, and about twice that or 1/8 to 3/16 in. for the interior, and that when good control is maintained. However, it may run higher than the figures mentioned.

Articles which appeared in THE FOUNDRY on centrifugal casting include: "Producing Nonferrous Castings Centrifugally", by Zuehlke, October 1942; "Casts Steel Centrifugally", by Donoho, April 1943; "Centrifuging After the Mold Is Filled", by Wright and Caine, May 1943; "Steel Sheaves Are Cast Centrifugally", by Johnson, June 1943; "Pours Steel in Cores Spun Vertically", by Paumer, July 1943; "Ford Casts Cylinder Barrels Centrifugally", August 1943; "It Can Be Cast Centrifugally," by Putchinski, August 1943.

Centrifugal castings machines are made by a number of manufacturers whose names appear in the advertising pages.

Trouble with Aluminum Caused by Magnesium

Q.—In dural aluminum clippings sold today there seems to be a small quantity of magnesium which affects the casting properties when made into castings. Could you recommend a procedure to eliminate the magnesium? We have been in the habit of adding another extra 4 per cent copper to the 96 per cent aluminum, 4 per cent copper dural in the form of a 50-50 aluminum-copper hardener. Castings made from that composition do not resist pressure, and we believe it due to the magnesium since we do not have trouble with No. 12 ingot.

A.—We do not believe that the dural or duralumin clippings today differ greatly from those of several years ago since those alloys always contained magnesium and some manganese—general composition being 4 per cent copper, 0.5 per cent each of magnesium and manganese, remainder aluminum. However, it is possible that you are getting an alloy similar to 24S which contains 1.5 per cent magnesium. Since removal of magnesium is accomplished by oxidation, it stands to reason that some aluminum also will be lost in that process, and we believe that you will be much better off to let the clipping go to a smelter who has the facilities and technical control to do the job properly.

However, if you want to try your hand you might use the following procedure: First get your crucible good and hot to reduce melting time as much as possible. Then place some heavy section scrap in the pot and let it melt to form a liquid heel filling about one-third. With a hot pot that should not take long. Add small amounts of the clippings which are forced into the heel to reduce exposure to the hot atmosphere, and to promote rapid solution. If the heel shows signs of cooling down cease adding clippings until it gets hot and fluid. Continue the cycle until the pot is nearly full of molten metal.

Raise the temperature of the metal to about 1650 F. and hold for a while. Add the aluminum-copper hardener. Flux with a mixture of 50 per cent sodium silicofluoride and 50 per cent sodium chloride, or previous to that try adding 2 or 3 ounces per 100 pounds of metal of sodium, potassium or ammonium bichromate. Skim off that dross and allow the temperature to drop without any disturbance of the metal until it reaches 1275 to 1300 F. Degasify with nitrogen allowing 10 to 15 minutes per 100 lb of metal, having sufficient flow of gas to give a good rolling boil. Following degasification, the temperature can be increased to the desired pouring range and made into castings.

Melting Procedure May Require Study

Q.—Will you please let us know what is the most satisfactory and modern method for melting brass? Our requirements would be approximately 2000 lb per day. We would also like to know if there is a handbook covering melting and molding for brass casting.

A.—So far as we know there is no one type of melting equipment which will meet every and all conditions which might be encountered. A number of factors must be considered before a decision can be made on the most suitable equipment for the particular froundry, and they will include cost and type of fuels available, whether a single alloy or a wide range of alloys are to be produced, whether the metal demand is uniform throughout the day, or whether the demand is for large and small quantities at irregular intervals, etc. For example, if electric power can be obtained at a reasonable cost, the castings are light or medium in weight, the molds made at a uniform rate throughout the day, and only one type of alloy is made (or perhaps two or three which do not contaminate each other), melting might be accomplished economically in a small electric furnace with a capacity of 200 to 250 pounds.

However, if several different alloys are to be produced which may contaminate each other—for example, lead-containing and lead-free alloys; yellow brass with a small amount of aluminum and pressure-resistant castings; etc.—it would be necessary to use separate crucible melting since the lining would retain enough of the contaminant to cause trouble. Also, if large and small quantities of metal are demanded at irregular intervals, melting equipment would have to be flexible enough to meet the requirements, and crucible melting with different size crucibles might be desirable. In crucible melting use of oil or gas as the fuel gives better control of furnace conditions, and more rapid melting than in the case of coke fuel although forced-draft, coke-fired furnaces will melt fairly rapidly. In our opinion, the most satisfactory way for you to obtain information on the most desirable melting equipment for your equipment for your conditions, would be to engage the services of some nonferrous consultant or expert, and follow his advice.

(*Concluded on page* 116)

☆ ☆ *Nickel*

ASSURES CONSISTENTLY BETTER CASTINGS

Large or small . . . for all castings in which your customers demand improved physical properties, increased pressure requirements or greater wear resistance . . . Nickel will help you satisfy these demands.

Nickel also serves as a valuable tool within the foundry itself by alleviating such problems as porosity, shrinkage, chilled corners and edges and non-uniformity in castings of irregular section or unusual design.

Suitable forms of Nickel and Nickel alloys have been developed to simplify its use by both ferrous and non-ferrous foundrymen.

★

Our technical staff and the casting specialists of our distributors have had many years of experience with foundry problems. They will welcome the opportunity to cooperate with you.

THE INTERNATIONAL NICKEL COMPANY, INC. 67 WALL STREET NEW YORK 5, N. Y.

(*Concluded from page 114*)

Another method would be to submit your problem, giving all the available information, to manufacturers of various types of furnaces, and ask for recommended equipment. In addition, have the man who will be in charge of the department visit a number of foundries which are doing work similar to what you are planning. In that way, first-hand information could be obtained, especially if the foundries selected use different types of melting equipment.

As far as books on nonferrous molding and melting are concerned, they are few and far between. The most recent one is "Nonferrous Foundry Practice", by Laing and Rolfe. Practices outlined in the book are those used in England which differ in many respects from those employed here. Dews' "Metallurgy of Bronze" gives an insight into the metallurgical phases of bronze melting, and should be a valuable addition to your library.

To Fuse Steel Plates On Anvil Blocks

Q.—We would like to know how we can attach or fuse on steel tops on blacksmith anvils. We have made a few of them but find that the steel does not fuse on to the cast iron. If there is any solution we can mix into the hot metal to make the tops fuse on to the cast iron we would appreciate hearing from you.

A.—Method of attaching the tool steel plate to the face of a cast iron anvil is based on the same principle as that occasionally employed in foundries for repairing castings and known as "burning on". The face of the plate is cleaned thoroughly either by sandblasting or pickling and then covered with a thin film of oil or shellac to prevent condensation of moisture and consequent development of a slight scale or oxide film. The plate is placed in the bottom of the mold and above a cavity almost equal in area to the plate. Metal is poured into this cavity and allowed to stand until the plate becomes red. Length of time depends on the size of the cavity and the size and thickness of the plate. Condition of the plate may be noted by looking down through the riser opening in the cope of the mold. With the plate in suitable heated condition, metal is poured into the mold proper through a gate which spreads a stream of metal over the plate from one end. An exit gate is provided at the opposite end slightly above the level of the plate. Sufficient metal is poured over the plate at this stage to insure a fused joint. No hard and fast rule has been developed for guidance on this phase of the operation. It is one of the shop kinks or trade practices that can be learned only through actual experience. The most essential feature is exceedingly hot metal. When the operator is satisfied that fusion has taken place, the exit gate is plugged and the remainder of the mold is filled in the usual manner.

Skill Needed for Lost Wax Procedure

Q.—Where can we obtain a book on the cire-perdu method of molding and also a foundry dictionary.

A.—So far as we are aware, no book has been published on the cire-perdu or lost wax process of molding. The term is correct enough in the original Italian, but like many other phrases in foreign languages, it does not carry its own nice shade of meaning when translated into the literal English. Thus while cire-perdu in Italian simply means a wax model or pattern that is melted out of a mold to make room for the metal, the term lost wax in English seems to connote a total loss of something during the process.

The process has been described on several occasions in THE FOUNDRY in descriptions of foundries engaged in the manufacture of statuary and ornamental bronze castings. Briefly, a clay model is prepared by the sculptor. Plaster is built around the model either in one piece or in sections depending on the size. The plaster mold is removed from the model and the clay is taken out. The inside of the plaster mold is painted with vaseline. A small mold is filled with molten wax. When a shell of wax has developed the approximate thickness of the casting, the remainder of the wax is spilled out.

On large pieces the thickness of wax is laid on in the form of wax sheets. Odd and difficult plates are built on by hand. In either case a core is built up inside the wax. The entire mold is placed in an oven. In large pieces a fire is built inside and all the wax melted out. The mold then is secured in a flask or in a pit and filled with metal. The description sounds simple, but the work requires a high degree of skill and knowledge only gained through experience.

As far as a foundry dictionary is concerned a committee of the AFA prepared a foundry dictionary some years ago.

Gives Several Reasons For White Fracture

Q.—We are sending a sample casting which shows a condition we would like to overcome in that most of it has a white fracture. This appears to happen only in the first charge of iron run from the cupola. Our mixture of 1500-lb charges is made up of 600 lb of pig iron containing 3.13 per cent Si, 200 lb gates, 150 lb over-iron, and 550 lb of commercial scrap. The blast is 11 oz. This condition occurs in cored, and uncored castings alike.

A.—Theoretically, and assuming that the remelt iron and foreign scrap contain 2.00 per cent Si, the resulting iron should show a Si content of 2.45 per cent and therefore should be gray and easily machinable in small castings. The broken section of the casting submitted is white almost all the way through. The remainder is dense and much darker in color than normal iron should be. Apparently the Si content is far below the anticipated amount. One, or a combination of factors may be responsible for this condition. Possibly the foreign scrap may contain steel, malleable iron, burned iron or hard iron. The relatively high Si content of the pig iron is not sufficient to produce the proper balance. Possibly the first iron boils on a wet bottom or in a wet ladle. Possibly the scrap is charged first and followed by the pig iron. Possibly the cupola is tapped before the first charge has completely melted.

The phenomena of hard, cold iron from the first tap was so well recognized by old-time foundrymen, that the iron was pigged. In modern practice the taphole is stopped before the wind goes on and the first iron is as good as the last. In the present instances we suggest getting a hot bottom and lining in the cupola. Charge the pig iron first on the coke. If the well of the cupola will not hold a complete charge, provide a mixing or reservoir ladle under the spout and tap at least a full charge into it before carrying the iron away in shank or hand ladles. Where a low silicon iron is close to the edge of the chilling line, it can be raised to the safety stage by increasing the pig iron content in the charge, or by adding ferrosilicon to the iron in the cupola or in the ladle.

Castings Are Salvaged In Several Ways

Q.—We would appreciate information on repairing defective castings for machining. Especially useful would be a method of repair that would hold pressure.

A.—Several methods are available for reclaiming defective castings and include welding, impregnation and filling. Welding may be either fusion or low temperature type. In the fusion type, the edges of the defect are raised to the melting point by the torch or arc along with the material forming the welding rod which usually is the same composition as the casting. In low temperature type welding the casting is heated to 900 to 1400 F along with a special composition welding rod. Bronze welding using a rod containing 60 per cent Cu, 40 per cent Zn, and small amounts of Ni, Mn, etc., requires a temperature around 1600 F.

Impregnation involves forcing a solution into a casting with all but one opening closed, under such pressure that the solution penetrates into the porous sections. Solutions may be comprised of synthetic resin which requires baking in place to attain proper imperviousness, or sal-ammoniac which is allowed to air dry. Silicate of soda (water glass) also is used, but mainly for aluminum castings. Impregnation generally is employed after the casting has been machined. Filling involves use of special iron powders or cements which when mixed with water form a putty-like material which is pressed into the defects. However, such material should only be used to repair surface blemishes, etc., where physical properties are not concerned.

Sand Conditioning Is the Place to Lower Casting Costs!

Molding, melting, pouring and materials costs are fairly constant. Labor, too, is a known quantity. Where, then, can the foundryman look, to lower costs?

The answer is *sand conditioning.* When you use a Royer Sand Conditioner you actually cut costs these 4 ways:

1. Requires minimum of man-power.
2. Saves on sand by making it usable longer.
3. Reduces casting cleaning time through smoother molds, requiring less chipping and grinding.
4. Lowers discount by eliminating causes of run-outs, drops, inclusions and rough surface finish.

In the days to come, if material and labor costs remain static, the savings in time and manpower afforded by the Royer will be more important than ever.

The Royer with its unique "combing belt" provides sand that is double-aerated, free of contamination and thoroughly blended as no other type of sand conditioner can do it! Send for the complete story—Catalog 45.

ROYER

FOREMOST IN SAND CONDITIONING EQUIPMENT

ROYER FOUNDRY & MACHINE CO.
KINGSTON, PENNSYLVANIA

MEN of Industry

WILLIAM W. MALONEY

WILLIAM W. MALONEY has been elected secretary and chief administrative officer of the American Foundrymen's Association by the board of directors, succeeding **Robert E. Kennedy,** who has been named secretary emeritus. Mr. Maloney was graduated from the University of Illinois and has had extensive experience in publication, publicity and advertising work. For a time he was with the Penton Publishing Co. at Cleveland and Chicago, in an editorial capacity. Following a year spent on a merchant ship in the Southern Pacific, he joined the *National Provisioner*, Chicago, leaving there in 1929 to go with the AFA, where he assisted in publication work of the association. Four years later he became associated with the *Drover's Journal Press*, Chicago, doing printing and publicity work. In 1935 Mr. Maloney joined the Chicago, Burlington & Quincy Railroad in an advertising capacity. He returned to the AFA in 1942 as staff assistant, was made assistant secretary in 1943, and business manager in November, 1944.

CARL E. ROWE

◆ ◆ ◆

Carl E. Rowe, until recently chief industrial engineer, Illinois Malleable Iron Co., Chicago, has joined the Foundry Division, Muskegon Piston Ring Co., Sparta, Mich., and will head up the postwar program for the latter company. Mr. Rowe entered the foundry industry at the Milwaukee works of International Harvester Co., and later was transferred to its tractor works in Chicago. For several years he worked for consulting engineering companies out of Chicago. He is secretary of the AFA Committee on Job Evaluation and Time Study, and has been active in this work with the Chicago Chapter of the association for several years.

◆ ◆ ◆

S. H. Standish has been named vice president in charge of engineering for all three plants of the Dayton Malleable Iron Co., Dayton, O., and will be responsible for its postwar expansion and improvement program. Mr. Standish was graduated from University of Michigan in 1905 and entered Michigan Malleable Iron Co., Detroit, the same year. He subsequently became associated with Wetherill Finished Castings Co., Philadelphia; Racine Steel Castings Co., Racine, Wis.; Northwestern Malleable Iron Co., Milwaukee; the Stowell Co., South Milwaukee, Wis.; Missouri Malleable Iron Co., East St. Louis, Ill., and National Malleable & Steel Castings Co., East St. Louis and Cicero, Ill. In 1926 he became affiliated with Dayton Malleable and has been general manager of the G. H. R. Foundry Division until his recent promotion.

William J. MacNeill who recently resigned as president, Federal Malleable Co., West Allis, Wis., succeeds Mr. Standish as general manager of the G. H. R. Foundry Division. Mr. MacNeill, a native of Wisconsin, was graduated from University of Indiana and received his master's degree in metallurgy at University of Wisconsin. He was associated with Federal Malleable for over 20 years. An active member of Wisconsin Chapter, AFA, he served as its president in 1939.

◆ ◆ ◆

George Maily has been appointed superintendent of the new mechanized gray iron foundry operated by Sargent & Co., New Haven, Conn. Mr. Maily entered the foundry industry with the Gorham Mfg. Co., Providence, R. I., as and apprentice, working on heroic size bronze statuary castings. Following foundry connections with the Keller Brass Co., Grand Rapids, Mich., and Sach Inc., Cambridge, Mass., he became

(*Continued on page* 120)

S. H. STANDISH

WILLIAM J. MacNEILL

GEORGE MAILY

No Mongrel Ore in WOODWARD Iron

ABSOLUTE courage is the mark of the *purebred* fighting gamecock. In the pit he never quits until he has been slain or killed his adversary. Those fierce fighting qualities that distinguish the thoroughbred game are not an accident. They are line bred. For generation after generation, the pure fighting strain is safeguarded from contamination by mongrel blood. Those who raise fighting gamecocks say that even a drop of common blood in the strain may produce a gamecock that won't stand the gaff.

Like the purebred fighting cock, Woodward iron is produced from a *pure strain*. Year in, year out, Woodward obtains its base ore burden from the *same ore body* on Red Mountain—three miles from its furnaces. *Uniform ore* is one of the chief reasons why Woodward has been able to maintain that consistent uniformity in the quality of its iron for which it is nationally known.

WOODWARD IRON COMPANY

WOODWARD, ALABAMA

Independent Since 1883

GENERAL SALES OFFICES: 1515 First National Building • Birmingham, Alabama • Phone 4-6786

(*Continued from page* 118)

associated with Sargent & Co. in 1937 as an assistant foreman in the brass foundry and later in the iron foundry. The new foundry started casting June 18.

♦ ♦ ♦

G. Ewing Tait, recently elected chairman of Eastern Canada and Newfoundland Chapter, AFA, is assistant manager of manufacturing in charge of metallurgical operations, Dominion Engineering Works Ltd., Lachine, P. Q. After working summers in Canada Iron Foundries Ltd., Three Rivers, P. Q., he was graduated from McGill University in 1930. He joined Dominion Engineering Works as metallurgist, working on technical control and costs, and subsequently became responsible for all foundry operations and metallurgical work in the plant, and for development of manufacture and sales of chilled and alloy iron rolls. Mr. Tait has served as a director of the Eastern Canada and Newfoundland Chapter since its organization in 1942, and was a member of the Cast Nonferrous Metals Advisory Committee to the Department of Munitions and Supply. He was chairman of Montreal Chapter, ASM, 1943-44 and for many years was a member of the Educational Committee of that chapter in the advancement of technical education work.

♦ ♦ ♦

Charles H. Saiter has been appointed sales manager in charge of the new heavy machine division recently established by the Cleveland Crane & Engineering Co., Wickliffe, O., to handle sales of heavy overhead traveling cranes and bending presses, bulldozers and special machinery. Mr. Saiter, until recently sales manager of the former heavy crane department, has been with the company for 23 years in various engineering and sales capacities.

♦ ♦ ♦

Robert M. Jones has been appointed foundry superintendent at the South Chicago plant of Carnegie-Illinois Steel Corp., succeeding **Dan A. Farrell,** who has been named supervisor of safety, with headquarters in Pittsburgh. Mr. Jones was employed in the Chicago plant's maintenance division prior to being made assistant foundry superintendent in 1940. Mr. Farrell, a graduate of the University of Illinois, started as an industrial engineer in the South Chicago mill in 1937, later became plant industrial engineer and was promoted to foundry superintendent in 1940.

♦ ♦ ♦

B. Vere Nutt, formerly executive vice president, Moline Iron Works, Moline, Ill., has been elected chairman of the board of directors, succeeding his father, **L. E. Nutt.** The new chairman, who joined the company 24 years ago, has been in charge of production since 1935. Other officers recently elected, include: President, Merle C. Nutt; vice president, L. E. Nutt; treasurer, William J. Dowsett; secretary, Wallace A. Hall; assistant secretary, Alvin M. Vehmier.

♦ ♦ ♦

E. C. Salzman, vice president in charge of sales, Robins Conveyors Inc., Passaic, N. J., has been put in charge of all export operations, with headquarters in New York. **J. F. Meissner,** vice president, and until recently in charge of the Chicago office, has been transferred to Passaic, and will direct engineering sales. **A. E. Conover** has been appointed director of equipment sales. Mr. Conover was previously manager of the vibrating machinery division. **T. W. Matchett,** secretary of the company, will handle sales research and training.

♦ ♦ ♦

Julius A. Kayser has been named vice president and general sales manager, Laclede-Christy Clay Products Co., St. Louis, succeeding **John L. Cummings,** who has become vice president and director of sales. Mr. Kayser is a graduate of the Royal Technical Institute, Copenhagen, Denmark, and has served as research ceramist, plant superintendent, divisional sales manager, and chief refractories engineer. **Harvey R. Hiller,** formerly district manager of the Chicago territory, has been appointed an assistant vice president and will have charge of sales in his former territory and in Wisconsin, Michigan, Northern Illinois and Indiana. A graduate of Carnegie Institute of Technology, he has been with the company 22 years. **John W. Rogers** has also been appointed an assistant vice president and will continue as sales manager of the glass refractories division.

♦ ♦ ♦

Ray E. Valentine, who has been chief of the Malleable Iron Section, WPB, since 1943, has returned to National Malleable & Steel Castings Co. as St. Louis office sales agent. Mr. Valentine, who has been with the company since 1912, after serving in the traffic department, joined the sales division in Cleveland, in 1914. In 1927 he was assigned to the St. Louis sales office and the following year went to the Chicago plant, remaining there 16 years.

♦ ♦ ♦

H. B. Kraut, since 1929 president of the Giddings & Lewis Machine Tool Co., Fond du Lac, Wis., has been elected chairman. He has been succeeded as president and general manager by his son, **Ralph J. Kraut,** recently returned from active Army duty in the Pacific theater.

♦ ♦ ♦

Stanley E. Johnson, general sales manager, the Cooper-Bessemer Corp., Mt. Vernon, O., has been elected a vice president and member of the board of directors. **Charles G. Cooper,** manager of the Washington office, has also been elected a director.

♦ ♦ ♦

William M. Jones, Washington, has been appointed sole representative for the sale of Buckeye silica firestone for the Cleveland Quarries Co., Cleveland, in the states of Delaware, Maryland, Virginia and eastern West Virginia.

♦ ♦ ♦

Lt. Harvey Picker, USNR, recently returned to inactive status by the Navy, has been elected president, Picker X-Ray Corp., New York. Lt. Picker served

(*Continued on page* 124)

G. EWING TAIT

CHARLES H. SAITER

ROBERT M. JONES

B. VERE NUTT

THE LAST DROP IS AS GOOD AS THE FIRST

Ask the Men Who Use It!

HOW DO YOU LIKE YOUR STEAK?

Rare? - Medium? - or well? We-l-l-l, perhaps you'd take ANY kind of steak these days. But you DON'T have to take any kind of core oil! Take the best... insist on DAYTON OILS. Their uniform, unvarying quality has withstood the test for 25 years. Ask your foundry friend. He's probably using DAYTON OILS.

The DAYTON OIL COMPANY

DAYTON 1, OHIO

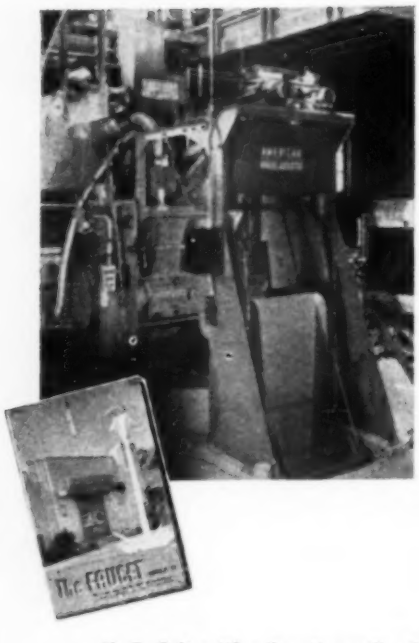
STEEL CORE AND MOLD WASHES - BINDER AND CORE PASTE - CORE WASHES - CHILL COATINGS

Why the WHEELABRATOR is Spotlighted by Customers in Their Advertising

PERFORMANCE on a comparative basis has won top-ranking distinction for the Wheelabrator in nearly 3,000 installations. Many of these plants have capitalized on the prestige-building power of their Wheelabrator by publicizing it in their advertising—the theme being that modern equipment reflects ability to produce quality work.

Commercial shops, too, are taking advantage of the fact that customers prefer Wheelabrated castings, because they come perfectly free of sand and scale—an important advantage in simplifying inspection, speeding machining and grinding, and making cutting tools last longer.

You will find Wheelabrator users proud of their equipment. That is why they advertise it so frequently in brochures, sales literature, and publicity. Typical examples illustrating this fact are shown on these pages.



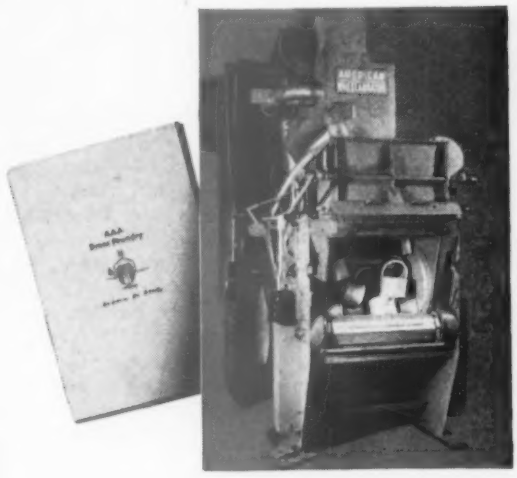
H. B. Salter Mfg. Co., Marysville, Ohio, manufacturers of plumbing fixtures, features the "Modern Casting Cleaning Wheelabrator" in their company magazine under the heading, "New and enlarged factory to better serve your peacetime fixture requirements."

From "LADLE SPARKS" Magazine published by Sivyer Steel Casting Co., Milwaukee, Wisconsin.

Finishing gets under way. The first step is a simple one—removal of adhering sand by shot-blasting. This may be done in the blast-chamber shown on the cover or in this up-to-the-minute Wheelabrator. And don't think this is a glorified tumbling barrel. We've too much respect for Sivyer castings to tumble them. Instead the Wheelabrator slowly rolls castings over to expose all surfaces to the blast of steel shot. When castings come out, any obvious defects are discernible and castings are either rejected or remarked for correction.

WORLD'S LARGEST BUILDERS OF AIRLESS BLAST EQUIPMENT

LaPlant-Choate Manufacturing Co., Cedar Rapids, Iowa, displays the Wheelabrator Table, used for removing heat treat scale, in their house magazine, "LaPlant-Choate Topics."

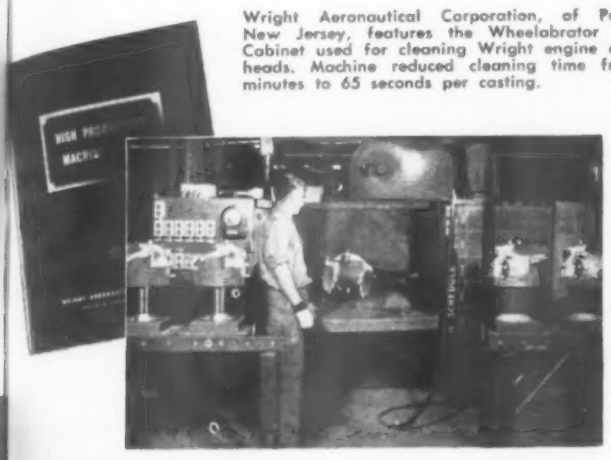


AAA Brass Foundry, San Francisco, California, advertises the fact that the Wheelabrator shown above cleans castings completely, removing all burrs and sand inclusions, with resultant longer tool life in machining operations. Machine handles castings at the rate of 5000 pounds per hour.

ion Foundries and Steel Ltd., Hamilton, a, uses a large Wheelabrator Tumblast for cleaning steel gs. Photograph appeared in the company house magazine, sco Illustrated News."

Link-Belt Company uses the American Wheelabrator Table to clean 37 mm. armor-piercing shot at its Indianapolis plant. Photograph was featured in "Link-Belt News."

Wright Aeronautical Corporation, of Paterson, New Jersey, features the Wheelabrator Special Cabinet used for cleaning Wright engine cylinder heads. Machine reduced cleaning time from 15 minutes to 65 seconds per casting.



American
FOUNDRY EQUIPMENT COMPANY
505 S. BYRKIT ST.
MISHAWAKA, INDIANA

(*Continued from page* 120)

with the Navy Liaison Officer, Radiation Laboratory, Massachusetts Institute of Technology, Cambridge, Mass., for the last three years. He joined Picker X-Ray Corp., of which his father, James Picker, is founder and chairman of the board, in 1938 and was executive vice president until he went on active duty with the Navy in May, 1941.

♦ ♦ ♦

Raymond S. Davis, manager, National Malleable & Steel Castings Co., Indianapolis, is the newly elected chairman of the Central Indiana Chapter, AFA. Mr. Davis was graduated from Rose Polytechnic Institute in 1917, joining the National Malleable organization as a molder at the Indianapolis works, at that time. He was made a molding foreman a year later and in 1919 assisted the foundry superintendent in gating and other foundry engineering problems, becoming plant engineer in 1920. In 1929 he was made assistant manager, and in 1943 became manager of the plant. Mr. Davis served his chapter as vice chairman last year.

♦ ♦ ♦

William B. Burt has joined the Kindt-Collins Co., Cleveland, as special sales representative. He is well known throughout the patternmaking industry, having been associated in a sales capacity the last 21 years with the Wellman Products Co., Cleveland, and for the last 3 years as sales manager of that company. Mr. Burt came to the United States in 1922 from Scotland, where he had been engaged since 1910 in the purchasing division of Albion Motors Ltd.

♦ ♦ ♦

Edward C. Hoenicke, assistant to the general manager, Eaton Mfg. Co., Detroit, has been elected chairman of the Detroit Chapter of the AFA, for 1945-46. During the first six months of 1944, Mr. Hoenicke served as consultant to the Gray Iron Castings Section, War Production Board, Washington, returning to Eaton Mfg. Co. in August of that year. He entered the foundry industry in 1916 with Oliver Machinery Co., Grand Rapids, Mich. Subsequent connections included E. S. Bryant Pattern Works, American Blower Co., Bohn Aluminum Co., Ford Motor Co., and Oakland Motor Co., all of Detroit. In 1928 Mr. Hoenicke became sales engineer, Holley Permanent Mold Machine Co., Detroit, and when Eaton-Erb Foundry Co. was organized in 1932, he was made sales manager. The Eaton-Erb company later became the Eaton Mfg. Co., Foundry Division. An active member of the Detroit Chapter, Mr. Hoenicke was vice chairman last year.

♦ ♦ ♦

Thomas W. Pangborn, president, Pangborn Corp., Hagerstown, Md., has been awarded an honorary degree of doctor of laws by Mount Saint Mary's College, Emmitsburg, Md.

♦ ♦ ♦

C. L. Liebau, for the past 11 years vice president in charge of sales, Federal Malleable Co., West Allis, Wis., has been made vice president of the company, and will take over the duties of William J. MacNeill, president and general manager, who has resigned.

♦ ♦ ♦

Keen Johnson, for the past year assistant to the president, Reynolds Metals Co., has been made a vice president, with offices in Washington. Mr. Johnson succeeds **W. G. Golden,** active for many years in the Reynolds organization, who is retiring because of ill health.

♦ ♦ ♦

Roy H. Mackay and **J. W. Pulte** have been put in charge of new branch offices of Ilg Electric Ventilating Co., Chicago, at Knoxville, Tenn., and Grand Rapids, Mich., respectively. **Marvin Gardner** has been appointed sales engineer in the Dallas, Tex. office of the company, and **George A. Innes,** sales engineer at Philadelphia.

♦ ♦ ♦

Fred Mueller has been elected vice president, Corn Products Refining Co., New York. Mr. Mueller joined the company in 1902, was made vice president and director of Corn Products Sales Co. in 1934 and general sales manager of Corn Products Refining Co. in 1944.

♦ ♦ ♦

Harold C. Osman, recently sales manager of Crucible Steel Casting Co., Lansdown, Pa., has been elected vice president and sales manager. Mr. Osman formerly was connected with American Steel Foundries in the operating department of its Indiana Harbor, Ind., plant, leaving there after several years to become sales manager and secretary of Electric Steel Foundry, later known as the Nugent Steel Castings Co., Chicago. Ten years later, in 1930, he left the steel foundry business but returned in 1935 to become sales manager of the Reading Steel Casting Division, American Chain & Cable Co. Inc., Reading, Pa. Mr. Osman joined Crucible Steel in 1944 as sales manager.

♦ ♦ ♦

Robert E. Wendt has retired as instructor in foundry practice at Purdue University, following 35 years on the staff of that school. Mr. Wendt received his earlier training in the public schools of Indiana, and later, while working, completed a course with the International Correspondence Schools. His foundry connections included work with the M. Rumely Co., La Porte, Ind., from 1891 to 1899. Following a year with the Mueller Brass Works he returned to the Rumely company until 1910 when he joined the Purdue faculty, advancing to the rank of instructor there in 1919. Mr. Wendt has written extensively on foundry subjects and is author of a textbook on foundry work.

♦ ♦ ♦

S. C. Lawson, until recently central divisional manager, Ampco Metal Inc., Milwaukee, has been appointed assistant general sales manager in charge of field operations. **Philip F. Erlandson** has been appointed eastern zone manager with headquarters in Newark, N. J. **William J. De Muth** has been transferred from Buffalo to Newark, N. J., as district manager of that territory. **W. T. Peterson,** formerly in the Newark area,

(*Continued on page* 126)

RAYMOND S. DAVIS

WILLIAM B. BURT

EDWARD C. HOENICKE

THOMAS W. PANGBORN

FOR YOUR TOUGHEST MATERIALS HANDLING JOBS . . . SPECIFY THE NEW
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-with 30% Longer Life!
The tougher the jobs, the better this new Philco "Thirty" Storage Battery shows up. For long ramps and heavy loads — Philco "Thirty" delivers the power. And — in addition — it gives 30% longer life! Write today for the new Philco "Thirty" catalog.
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PHILCO CORPORATION
STORAGE BATTERY DIVISION
TRENTON 7, NEW JERSEY
FOR 50 YEARS A LEADER IN INDUSTRIAL STORAGE BATTERY DEVELOPMENT

(*Continued from page* 124)

has been transferred to Detroit, as central zone manager. **Emil Svoboda** has been named district manager of the Cleveland and Pittsburgh offices, with headquarters in Cleveland. **John C. Kemp,** until recently in the engineering department at Milwaukee, has been transferred to Cleveland as field engineer. **Baxter Schroeder,** formerly field engineer at Cincinnati, has been named field engineer at Buffalo. The new midwestern zone manager is **W. B. McKenzie,** with headquarters at Chicago. **Jack Bybee** has been transferred from Detroit to Milwaukee as district manager. **J. W. Nebel** has been appointed district field engineer at Milwaukee.

♦ ♦ ♦

James Prendergast, for 36 years superintendent and manager of the foundry division, Sullivan Machinery Co., Claremont, N. H., has retired, after 53 years continuous foundry experience. Mr. Prendergast entered the industry at the age of 11, in Manchester, England, and was bound apprentice to the trade for 7 years. He later became one of the first molders employed at a foundry which General Electric Co. opened in Birmingham, England, in 1903. After a year and a half, during which time he became foreman and assistant to the foundry manager, Mr. Prendergast joined Bellis & Morcom Co., Birmingham, resigning in 1905 to come to America. Upon arrival, he became associated with the Sessions Foundry Co., Bristol, Conn., as a molder and remained as foreman until 1909, when he joined Sullivan Machinery Co. as foundry superintendent, becoming foundry manager a short time later.

♦ ♦ ♦

Tom E. Barlow, metallurgist, Battelle Memorial Institute, Columbus, O., has been elected chairman of the Central Ohio Chapter, AFA, for 1945-46. Mr. Barlow, a graduate of University of Michigan, became associated with Ecorse Foundry, Detroit, in 1935, joining the Battelle staff the following year. With the inauguration of a program by the Copper and Steel Development Association to apply results of research to commercial practice, he served as field engineer for that organization, later becoming associated with Vanadium Corp. of America in 1940, where he remained 4 years. He was appointed to the research staff of Battelle in 1944. When the Central Ohio Chapter was organized last year Mr. Barlow was elected vice chairman.

♦ ♦ ♦

Ward Dougherty, formerly manager of the machine division contract department of the Osborn Mfg. Co., Cleveland, has been appointed manager of the company's newly established export department. Mr. Dougherty has been with the company 25 years.

♦ ♦ ♦

Carl E. Von Luhrte, recently elected chairman of the Quad-City Chapter of the AFA is sales representative, Chicago Retort & Fire Brick Co., Davenport, Iowa, in the Quad-City area. Mr. Von Luhrte has been connected with the refractories industry for the last 18 years, with a special interest in foundry refractories. An active member of the district chapter, he has served as a member of the entertainment committee, as chairman of the membership committee, and last year as vice chairman.

♦ ♦ ♦

Hansel J. Smith, until recently chief cost accountant, Harrison Steel Castings Co., Attica, Ind., has been appointed accountant and office manager, Davidson Enamel Production Co., Lima, O. Mr. Smith had been with the Harrison company for more than eight years.

♦ ♦ ♦

J. B. Swift, formerly sales engineer, Hydro-Blast Corp., Chicago, has joined Morton L. Pereira & Associates, Chicago, architects and engineers, and successors to Frank D. Chase Inc., Chicago.

♦ ♦ ♦

A. C. Fellinger, formerly manager of sales through distributors, Link-Belt Co., Chicago, has been appointed sales manager of power transmission machinery, with headquarters at the Ewart plant in Indianapolis. Mr. Fellinger, who has been with the organization since 1916, succeeds the late **C. Walter Spalding. H. F. Weber,** until recently central division manager for power transmission machinery, at Chicago, has been transferred to the Ewart plant as divisional sales manager, silent chain drives.

♦ ♦ ♦

William E. Brewster, assistant general superintendent, Wisconsin Steel Division, International Harvester Co., Chicago, has been appointed general superintendent, succeeding **L. B. Robertson,** who is retiring after nine years in that capacity and 26 years' service with the company. Associated with the company since 1910, Mr. Brewster has been assistant general superintendent since 1936. **Roy A. Lindgren,** who recently was advanced from superintendent of blast furnaces to second assistant general superintendent, now becomes assistant general superintendent.

♦ ♦ ♦

M. W. Hollands has been appointed plant metallurgist of William Kennedy & Sons Ltd., Owen Sound, Ont. Following his graduation from the University of Toronto in 1937, Mr. Hollands served as plant metallurgist with Fittings Ltd., Oshawa, Ont., and from 1940 to 1943 was inspecting officer of materials for the Department of National Defense and the Inspection Board of United Kingdom and Canada in Quebec and Ottawa. For the last two years he was plant metallurgist for Walker Metal Products Ltd., Walkerville, Ont.

♦ ♦ ♦

Leon J. Wise, formerly assistant to executive vice president, Allied Steel Castings Co., Chicago, has been made general manager. **Harold G. Evans,** plant superintendent, has moved up to works manager, and **William Harrison,** foundry superintendent, has assumed the position of plant superintendent.

♦ ♦ ♦

Hobart C. Ramsey, executive vice president of Worthington Pump & Machinery Corp., has in addition been named president of the Ransome Machinery Co., Dunellen, N. J., a subsidiary of Worth-

(*Concluded on page* 128)

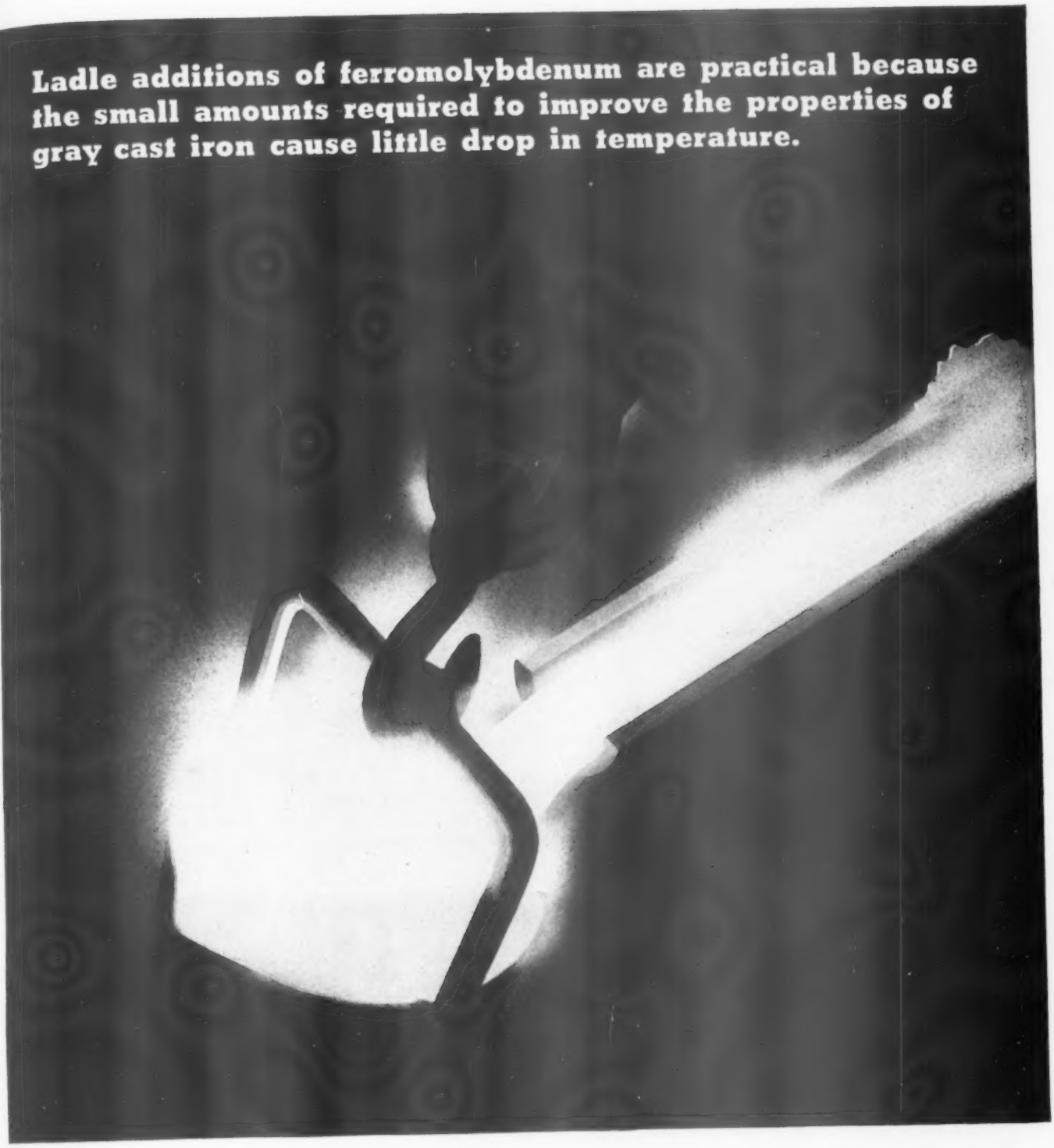
JAMES PRENDERGAST

TOM E. BARLOW

WARD DOUGHERTY

CARL E. VON LUHRTE

Ladle additions of ferromolybdenum are practical because the small amounts required to improve the properties of gray cast iron cause little drop in temperature.



CLIMAX FURNISHES AUTHORITATIVE ENGINEERING DATA ON MOLYBDENUM APPLICATIONS.

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Climax Molybdenum Company

500 Fifth Avenue · New York City

MOLY

(*Concluded from page* 126)

ington. Newly-elected directors of the Ransome company are **J. G. Ten Eyck**, new vice president and general manager, and **Carl F. Oechsle**, vice president in charge of sales.

♦ ♦ ♦

Homer E. Fryer, until recently foundry foreman at the Painted Post, N. Y., plant of Ingersoll-Rand Co., has been appointed general foundry foreman, Madsen Iron Works, Huntington Park, Calif. Mr. Fryer's previous connections included Goulds Pumps Inc., Seneca Falls, N. Y.; Clark Brothers Co. Inc., Olean, N. Y., and C. & G. Cooper, Mt. Vernon, O.

♦ ♦ ♦

Harry A. Feldbush, formerly works manager of the Holyoke, Mass., plant of Worthington Pump & Machinery Corp., has been named vice president in charge of engineering for the entire corporation. **Ralph M. Watson**, until recently chief engineer of the centrifugal engineering division, has been appointed assistant to Mr. Feldbush.

♦ ♦ ♦

J. M. Schlendorf has been elected vice president in charge of sales of Republic Steel Corp., Cleveland, succeeding **N. J. Clarke,** who has been made senior vice president. Mr. Schlendorf had been assistant vice president since 1936.

♦ ♦ ♦

P. R. Mork has been elected executive vice president, Crane Co., Chicago. Mr. Mork has been associated with Crane Co. since 1901 and has been a director of the company since 1941. **J. A. Dwyer** has been appointed to succeed Mr. Mork as vice president in charge of sales. He was formerly general manager of sales and branches and has served the company since 1919.

♦ ♦ ♦

Harry Derby, formerly of West Steel Casting Co., Cleveland, has been appointed superintendent, Buckeye Traction Ditcher Co., Findlay, O.

HARRY DERBY

♦ ♦ ♦

Leo Mallis, formerly associated with American Steel Foundries, has been appointed plant superintendent, Taft Alloy Steel Co., Taft, Calif.

♦ ♦ ♦

William A. De Ridder, a director of Adel Precision Products Corp., Burbank, Calif., since January, 1943, has been elected president and general manager of that organization. Mr. De Ridder, who succeeds **Ray Ellinwood,** recently resigned, joined predecessor companies of General Metals Corp., Vernon, Calif., in 1920, becoming president in 1937, a position which he will retain.

♦ ♦ ♦

Max F. Becker has resigned as vice president of the Whiting Corp., Harvey, Ill., to become a manufacturers' agent for foundry equipment in the Chicago territory. Mr. Becker had been associated with Whiting since his graduation from Purdue University in 1920, and had been vice president since 1940.

♦ ♦ ♦

George W. Parke has been appointed to represent the Buckeye Products Co., Cincinnati, in Indiana, Southern Michigan and Western Ohio. Mr. Parke had been sales engineer for the Standard Oil Co., for the last 18 years.

♦ ♦ ♦

Alfred Kauffman, retired president of the Link-Belt Co., Chicago, has been elected a director of the Gardner-Denver Co., Quincy, Ill., succeeding **P. H. Gardner,** who has resigned because of ill health.

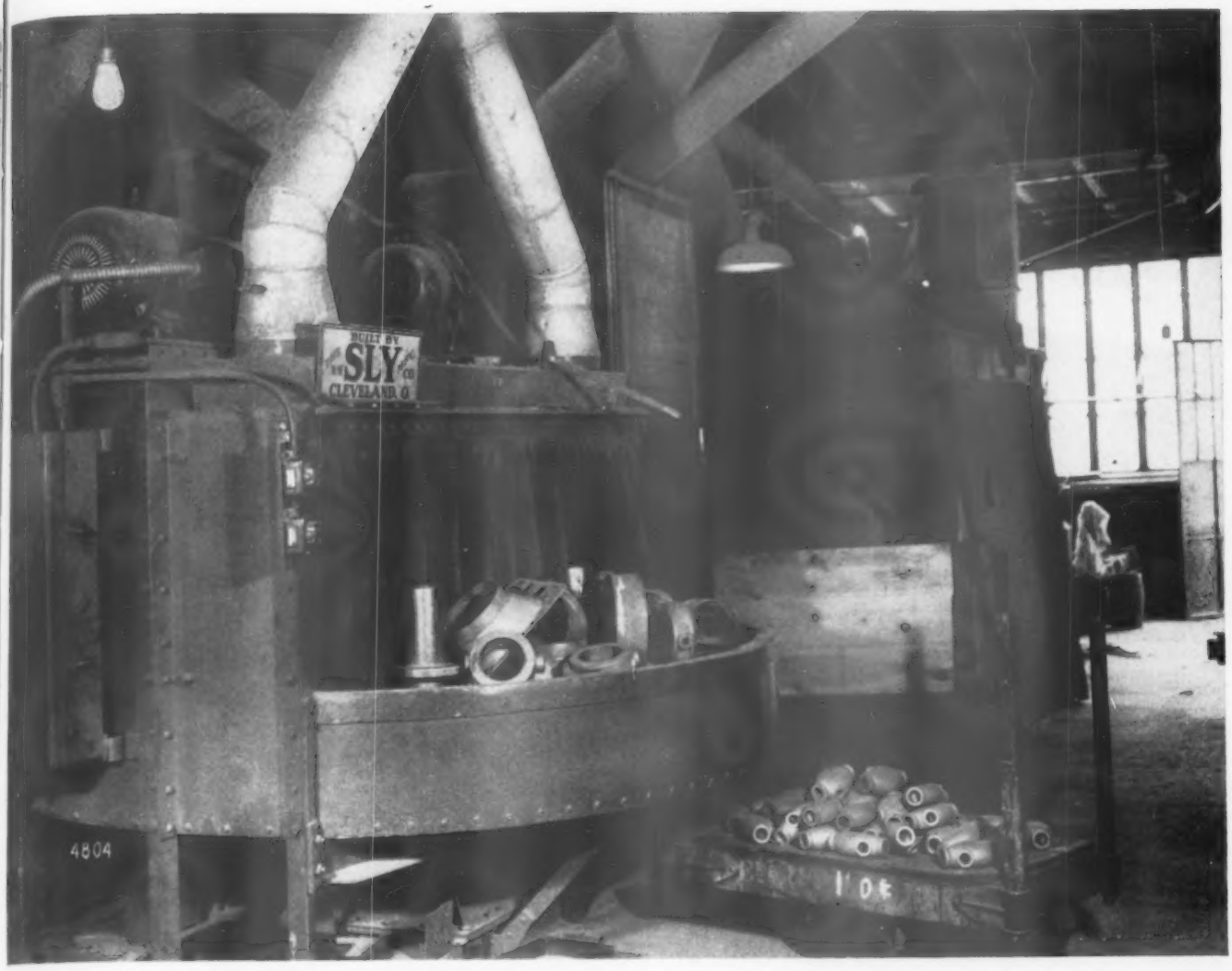
♦ ♦ ♦

Hiram Brown, formerly production metallurgist, Aluminum Industries Inc., Cincinnati, has been appointed assistant works manager of the Werk Road Plant of that organization.

♦ ♦ ♦

Keith Williams, president, Pratt & Letchworth Co., Buffalo, has been elected vice president and a director of the Army Ordnance Association, Empire Post.

GRAY IRON FOUNDERS: Showing some of the officers and directors of the Gray Iron Founders' Society at a recent meeting of the board in Cleveland. Standing (left to right)—Max Kuniansky, Lynchburg Foundry Co.; Homer Britton, Cleveland Foundry Co.; C. R. Culling, Carondelet Foundry Co.; H. S. Washburn, Plainville Casting Co.; E. B. Sherwin, Chicago Hardware Foundry Co.; G. H. Alten, Alten's Foundry & Machine Works; H. L. Edinger, Barnett Foundry & Machine Co. Seated (left to right)—F. H. Rayfield, Potter & Rayfield Inc.; W. W. Rose, executive vice president; W. L. Seelbach, Forest City Foundries Co.; R. E. Kucher, Olympic Foundry Co.; H. A. Stockwell, Barbour-Stockwell Co. (Photo courtesy *Cleveland News*)



SLY CENTRI-BLAST *Airless* HAS MANY USES, REDUCES COSTS

THIS Sly Centri-Blast Airless Rotary Table handles a large variety of work: Cleans castings, forgings, and stampings; removes heat treat scale; prepares surfaces for better bond of finish coatings; and does surface peening.

It offers many advantages: Speeds cleaning; reduces cleaning costs—saving power, labor, time, and space; cleans more thoroughly, saving time in machining and grinding, producing a better appearance; provides clean surfaces of good adhering qualities for bond of enamel, plating, etc.; surface-peening *to the right degree* permitting full control of all operations.

Ask for Centri-Blast Bulletin 99.

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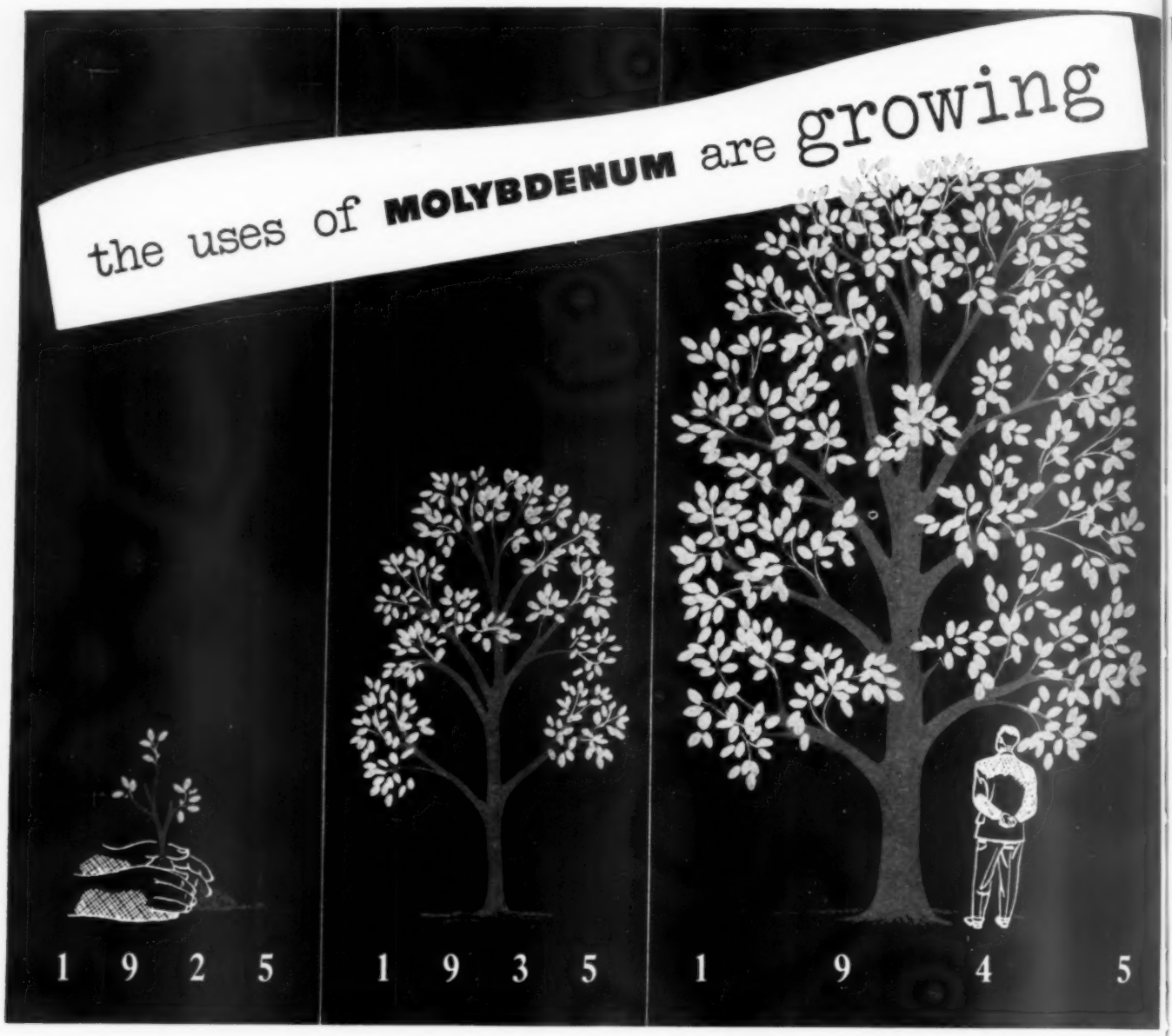
4753 TRAIN AVENUE CLEVELAND 2, OHIO

SLY INDUSTRIAL DUST CONTROL

TUMBLING MILLS • BLAST CLEANING EQUIPMENT

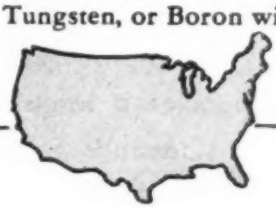


"All types of work will be included, but special emphasis will be on those using metals."

So reads a paragraph in a recent Government report. It relates to modernization of commercial buildings, but might apply as well to various departments of industry.

More use of metals. Better metals, of more specialized properties, for particular uses. More precise consideration of serviceability with a view to lower overall cost, in any given employment . . .

All this active search for better utilization of materials in post-war manufacture has enlarged and diversified the uses of Molybdenum. Knowledge of the possibilities is being rapidly advanced. The Molybdenum Corporation maintains a staff of technicians whose advice is often found helpful, and sends out informative literature on request. Inquiries on any proposed use of Molybdenum, Tungsten, or Boron will be welcomed.



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Works: Washington, Pa.; York, Pa.
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MOLYBDENUM CORPORATION OF AMERICA
GRANT BUILDING PITTSBURGH, PA.

MCA

USE OF RELATION CHART
Checks Foundry Efficiency

By WALTER ESTRUP
Michiana Products Co.
Michigan City, Ind.

MOLDING is the key to all operation. A foundry manager's dream would come true if he could maintain a full force of molders operating at their highest production rate. However, other factors enter into the making of castings besides molding, including coremaking, shakeout, sand preparation, closeup of molds, melting, and miscellaneous labor (such as ladle lining, pattern loft, crane operators, rod suppliers, etc.) Relation between molding time and the time spent on all these other necessary operations determines the degree of efficiency at which the foundry is operating.

To record this relationship, and make it the basis for subjecting operation to constant analysis, a relation chart should be set up, based on hours spent on each work classification in a given week. A relation chart expresses the time required for each of several foundry operations as a percentage of the molding time used. For example, a foundry using 1000 hours of molding time per week, and 100 hours for sand preparation and distribution, would have a sand factor of 10, or 10 per cent.

Relationship Expressed as Hours

Determining this relationship for each foundry operation, on a week-to-week basis, and recording it, provides the relation chart. This can be expressed as hours when applied against a molding hour norm of 100. An example of such a chart for a particular relationship is shown in the accompanying illustration.

At first glance, it would appear that a relation chart, such as illustrated, can only demonstrate the obvious conclusion that when the size of the molding group increases, or the production rate of the molding group increases, all incidental labor will rise in proportion and the relation between molding and this incidental labor will remain constant.

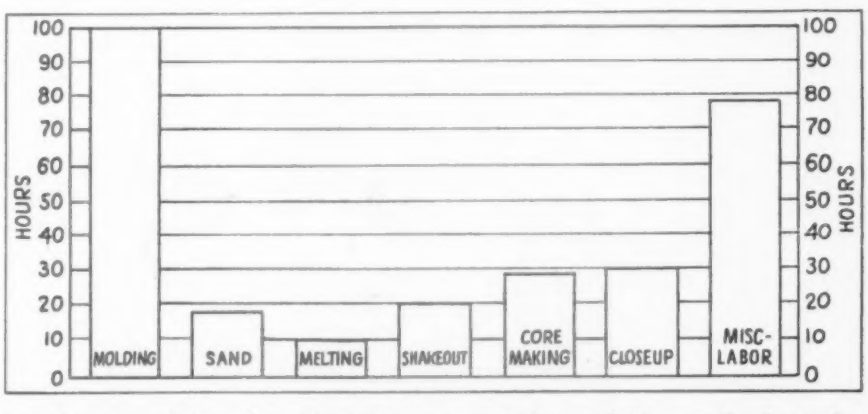
However, a little experience with these charts will show that this is not the case. If supervision is not constantly on its toes, and if adequately established standards are not employed, fluctuations may be found which bear no relation whatsoever to molding time or the molder production rate. It may be found that some of these departments are capable of handling double the load ordinarily given them. The foundryman studying the problem almost surely will find that a full force of molders, operating at a high rate of productivity, practically forces efficiency upon other departments. When the molding force is reduced, or the molders' production rate decreases, it will be found very often that several departments are carrying as much labor as they did when production was up.

As another example, the foundryman may know that one sand mixer can keep two molders supplied on a fast squeezer production job. And yet, when the relation chart is established, it may be found that sand time is 75 per cent of all molding time. If the foundryman asks "why?" and starts tracking down the answer to the problem, the relation chart has accomplished its purpose. It has led to an investigation of an operation which heretofore was taken for granted.

A further, and valuable, use for relation charts is in affording a basis for comparing the performance between production and jobbing departments. In one plant, having this dual setup, the molders in the jobbing department produce at an average rate of 50 lb of good castings per molder hour. Here the sand mixing time amounts to 30 per cent of the molding time. In the production department, where the molders produce at an average rate of 125 lb per hour, the sand mixers, using methods and equipment identical with the sand men in the jobbing department, use 68 per cent of the time the molders use. Investigation (prompted by a study of the weekly relation charts) revealed that, with a small degree of mechanization, the job of supplying sand to the jobbing group could be accomplished with no more than 15 per cent of the molding time, while much of the time devoted to mulling sand in the production department was unnecessary and reduction there probably would result in the sand mixing for this high production group being no greater, in relation to molding time, than in the lower production group.

Savings in manpower and labor cost in mechanized vs. non-mechanized departments are readily demonstrated when relation charts are available for a comparison of the two methods. In a partially mechanized shakeout operation, only 28 per cent of the time used by molders is required to shakeout, dispose of sand and flasks and transport castings to the cleaning room. In a nonmechanized shakeout operation, involving molds without flasks, the time required is 80 per cent of the time used by the molders.

It is not the purpose of this article to ascribe to relation charts potentialities not inherent in them. Of themselves they can accomplish nothing. Their chief value lies in starting the alert foundry manager on an investigation of those items which pull his plant efficiency down, regardless of the rate at which his molders are producing. You will no doubt find them an efficient check on the kind of job you and your supervisors are doing.



Example of a relation chart illustrating one particular condition. Such charts, developed weekly, indicate abnormal fluctuations in departmental operations

Lists Safe Foundry Job for Boys

Recommendations on the types of jobs in foundries suitable from the standpoint of safety to be filled by boys 16 and 17 years old, are contained in a pamphlet issued by the U. S. Department of Labor, Children's Bureau, Washington, and available upon request. One of a series of advisory standards covering various industries, it lists types of work in the various foundry departments and designates them either as too hazardous or as relatively safe and generally suitable.

Book Review

Steel Expansion For War, by W. A. Hauck, Steel Division, War Production Board; published by the Penton Publishing Co., 1213 West Third St., Cleveland 13; 192 pages, 8¼ by 11 inches; printed on heavy, coated paper; 148 pictures plus charts and tables; price $2 postpaid.

This volume is an official, historical report prepared for the War Production Board revealing detailed facts about the steel industry and the ore, ore transportation, coal and coke, foundry and forging industries associated with it. Data are presented on facilities installed or revamped by some 3000 companies, together with details on type of products, cost and added capacity.

Excerpts from this report covering new foundry capacity appeared in THE FOUNDRY for August.

INTERNATIONAL MOLDING MACHINES

are busy in foundries all over the United States performing their vital part in the war program. Where High Production is important, Foundrymen specify

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If you have a foundry problem . . . call our Service Engineer
He knows the answers from practical foundry experience

Photographs taken at J. E. Gilson Company, Port Washington, Wisconsin

Foundry Statistics

Malleable Iron Castings

	Production (Tons)			New Net Orders (Tons)		
	1945	1944	1943	1945	1944	1943
Jan.	83,742	75,594	63,572	97,153	93,855	73,524
Feb.	78,385	74,812	66,401	79,913	79,352	87,728
Mar.	86,175	81,480	78,143	98,979	90,038	85,744
Apr.	77,042	69,820	72,559	78,075	88,169	74,241
May	83,013	70,555	69,959	83,421	92,285	77,768
June	71,783	70,993	69,111	35,603	103,692	78,289
July	.....	61,320	66,011	.....	106,626	91,653
Aug.	.....	74,297	67,815	.....	71,307	108,505
Sept.	.....	74,628	74,874	.....	49,502	99,911
Oct.	.....	80,505	74,254	.....	76,536	101,510
Nov.	.....	79,629	72,077	.....	48,149	93,370
Dec.	.....	76,187	75,188	.....	69,972	81,978
Total	.....	889,820	849,764	.....	969,483	1,064,224

Steel Castings

	Shipments (Tons)		Production (Tons)		New Net Orders (Tons)	
	1945	1944	1945	1944	1945	1944
Jan.	201,162	237,570	157,176	159,795	210,182	167,739
Feb.	186,364	211,958	146,165	161,359	214,408	173,592
Mar.	211,890	224,913	166,896	174,626	203,170	162,575
Apr.	190,166	204,279	150,281	155,778	177,707	175,053
May	186,376	210,360	145,092	161,783	89,790	176,993
June	.....	200,237	.....	157,444	.....	181,816
July	.....	176,735	.....	131,940	.....	169,921
Aug.	.....	204,833	.....	154,911	.....	171,309
Sept.	.....	189,443	.....	144,458	.....	129,847
Oct.	.....	197,772	.....	150,719	.....	146,116
Nov.	.....	196,475	.....	146,411	.....	120,667
Dec.	.....	190,846	.....	144,162	.....	138,666
Total	.....	2,435,421	.....	1,843,386	.....	1,914,294

Note: Shipments for sale and own use; production and orders for sale only.

Aluminum Casting Shipments

(In millions of pounds)

	Total	Sand	Perm. Mold	Die
1943	459.5	304.2	89.6	65.7
Mar.	38.7	25.3	7.9	5.5
Apr.	37.1	24.3	7.6	5.2
May	37.7	25.0	7.7	5.0
June	36.3	24.1	6.9	5.3
July	37.2	24.7	7.1	5.4
Aug.	38.2	25.4	7.2	5.6
Sept.	40.8	27.2	7.9	5.7
Oct.	42.7	28.5	8.0	6.2
Nov.	43.0	28.5	8.3	6.2
Dec.	41.4	27.3	8.1	6.0
1944	514.5	321.1	106.3	84.2
Jan.	44.1	29.4	8.3	6.4
Feb.	45.9	30.2	8.0	7.5
Mar.	49.5	31.4	9.6	8.1
Apr.	42.9	27.0	8.3	7.3
May	44.7	27.9	8.9	7.5
June	42.4	25.9	8.8	7.4
July	38.7	24.5	7.7	6.2
Aug.	43.2	26.9	9.2	6.9
Sept.	41.5	25.5	8.9	6.9
Oct.	42.1	25.1	9.8	7.0
Nov.	40.5	24.3	9.6	6.4
Dec.	39.0	23.0	9.2	6.6
1945				
Jan.	43.5	25.3	10.6	7.3
Feb.	42.0	24.9	9.7	7.2
Mar.	48.2	27.7	12.2	8.1
Apr.	43.8	24.8	11.1	7.7
May	41.4	22.7	10.9	7.6

Foundry Equipment, Supplies

(In thousands of dollars)

	Shipments	Orders	Back-logs
1943	53,806	32,094	.....
Mar.	5,863	2,913	14,899
Apr.	5,365	2,678	12,904
May	4,718	1,774	10,513
June	4,825	2,319	9,017
July	4,017	2,405	8,345
Aug.	3,513	1,989	7,429
Sept.	3,881	2,070	6,930
Oct.	3,792	3,401	7,092
Nov.	3,563	3,422	7,076
Dec.	3,217	3,788	7,781
1944	41,914	44,906	.....
Jan.	3,336	3,515	7,910
Feb.	3,426	4,338	8,822
Mar.	3,679	4,370	9,513
Apr.	3,496	2,424	8,441
May	3,547	4,089	8,983
June	3,554	3,906	9,335
July	3,027	3,086	9,394
Aug.	3,818	4,115	9,691
Sept.	3,445	3,465	9,711
Oct.	3,758	4,293	10,246
Nov.	3,451	3,401	10,196
Dec.	3,377	3,912	10,731
1945			
Jan.	3,355	3,631	11,007
Feb.	3,548	4,103	11,562
Mar.	3,804	5,247	13,005
Apr.	3,685	2,678	11,997
May	3,741	3,778	12,034

Magnesium Casting Shipments

(In thousands of pounds)

	Total	Sand	Perm. Mold	Die
1943	65,967	59,123	3,978	2,866
Mar.	5,364	4,802	300	262
Apr.	5,237	4,694	284	259
May	5,263	4,652	343	268
June	4,690	4,159	296	235
July	4,940	4,406	290	244
Aug.	5,238	4,770	257	211
Sept.	6,008	5,391	390	227
Oct.	6,774	6,096	431	247
Nov.	6,792	6,068	453	272
Dec.	6,840	6,220	382	238
1944	83,979	75,221	6,396	2,362
Jan.	6,984	6,210	536	238
Feb.	7,293	6,603	469	221
Mar.	8,242	7,574	496	172
Apr.	7,520	6,922	413	185
May	7,357	6,664	514	179
June	6,535	5,729	598	208
July	6,481	5,653	656	172
Aug.	6,934	6,143	563	228
Sept.	6,945	6,147	608	192
Oct.	6,738	6,062	515	161
Nov.	6,639	5,919	521	199
Dec.	6,315	5,595	509	207
1945				
Jan.	7,005	6,149	609	247
Feb.	6,707	5,832	658	217
Mar.	7,664	6,700	683	281
Apr.	7,053	6,257	614	182
May	6,793	6,080	525	188

GRAY IRON CASTINGS—Production, Shipments and Unfilled Orders in Tons

1944	Production	Shipments	Unfilled Orders
Jan.	793,884	765,423	2,259,158
Feb.	772,764	764,369	2,145,027
March	840,890	828,648	2,184,268
April	765,784	757,880	2,159,280
May	789,007	790,674	2,204,572
June	765,581	763,459	2,215,183
July	698,418	689,744	2,313,845
Aug.	778,388	778,205	2,335,194
Sept.	768,661	744,954	2,304,323
Oct.	788,196	780,453	2,296,690
Nov.	769,734	760,383	2,300,350
Dec.	743,710	741,534	2,474,548
Totals	9,275,017	9,165,726	.....
1945			
Jan.	807,130	791,395	2,496,928
Feb.	752,935	752,266	2,562,076
Mar.	850,653	857,616	2,713,656
Apr.	768,588	773,988	2,640,642
May	806,297	798,055	2,602,986

By Type—Latest Months Reported

	Production	Shipments		Unfilled Orders		
		Total	For Sale	Total	For Sale	For Own Use
May, 1945						
Total	806,297	798,055	493,698	2,602,986	1,829,754	773,232
Pressure pipe, fittings	53,746	51,421	47,973	162,994	157,230	5,764
Soil pipe, fittings	15,718	16,422	16,422	155,521	155,521	.....
Chilled car wheels	86,255	84,104	77,872	259,715	247,121	12,594
Molds for steel ingots	171,772	170,868	80,263	322,418	191,023	131,395
All other gray iron	478,806	475,240	271,168	1,702,338	1,078,859	623,479
April, 1945						
Total	768,588	773,988	481,237	2,640,642	1,844,188	796,454
Pressure pipe, fittings	47,285	50,340	46,892	156,388	150,027	6,361
Soil pipe, fittings	13,929	14,698	14,698	146,756	146,750	.....
Chilled car wheels	81,280	83,900	76,060	246,991	229,113	17,878
Molds for steel ingots	160,772	163,474	80,287	334,231	196,655	137,576
All other gray iron	465,232	461,576	263,300	1,756,276	1,121,637	634,639

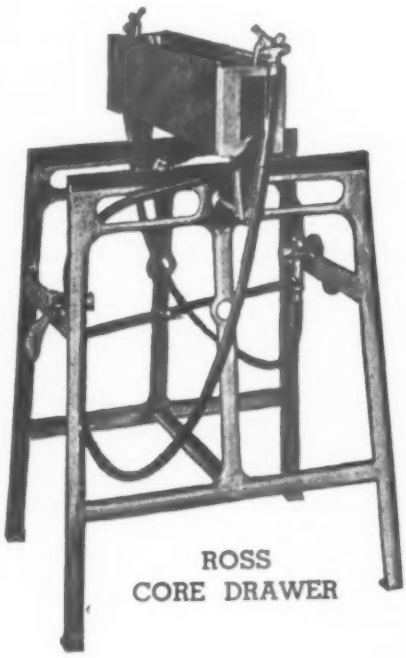
WPB figures reported by Bureau of the Census

BETTER FOUNDRY EQUIPMENT

GAST CORE AND MOLD SPRAYER

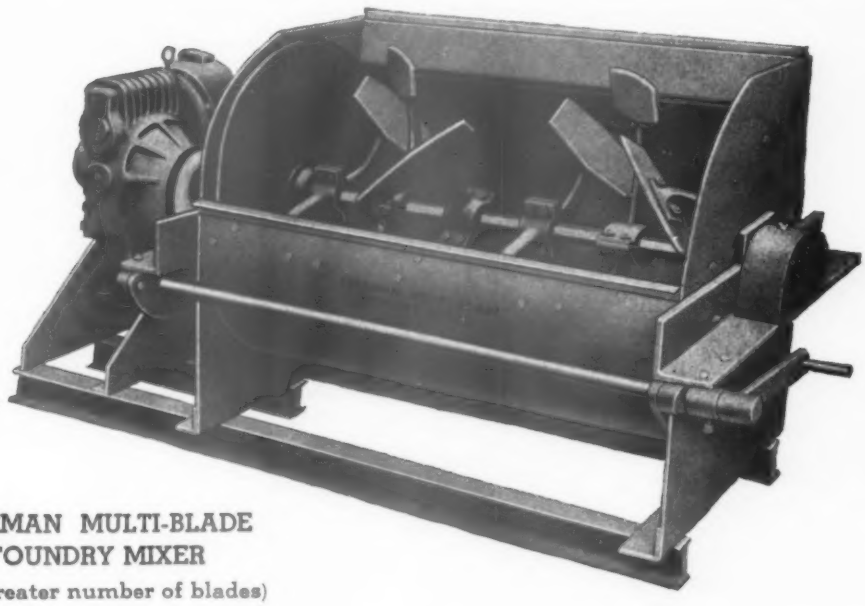
GAST CORE AND MOLD SPRAYER—This is a low-pressure, large jet atomizing sprayer, equipped with an air motor. It has a gear driven, paddle agitator for applying any type of wash to either green or dry sand molds or cores. It is regularly used with silica, naphtha or gasoline, talc and synthetic washes as well as the graphite or coke based materials. Wash is kept in suspension by paddle agitator when sprayer is used. Send for the whole story!

ROSS CORE DRAWER—If you are faced with a manpower problem (and who isn't?), remember that highly skilled labor is not required to draw cores on this machine and the more difficult boxes can be drawn just as fast as the easy ones. Many core boxes require no rigging at all. The Ross Core Drawer makes cores come true to size. Write for descriptive folder.



ROSS
CORE DRAWER

FREEMAN MULTI-BLADE FOUNDRY MIXER—Here is a mixer which has everything built-in as standard equipment, and includes many features not even available as accessories on other mixers. Send for a new booklet which explains how differently this mixer is built and just what you may expect of its operation in your plant.



FREEMAN MULTI-BLADE
FOUNDRY MIXER
(Note greater number of blades)

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Around DETROIT

BY A. H. ALLEN
Detroit Editor, The Foundry

Equipment changes at Buick gray iron foundry concerned mostly with improvement in working conditions. . . . Some observers see early shortage in gray iron capacity in Detroit area

AFTER a brief shutdown for inventory, shifting of equipment and installation of a considerable number of new machines, conveyors and accessories, the large gray iron foundry of Buick Motor Division in Flint resumed operations in the coreroom Aug. 6 and in the foundry itself Aug. 8. At the start it was planned to consolidate a limited amount of production of Buick and Olds engine blocks, heads and other cast components with a continuing schedule of war production, including such items as castings for N-26 tanks, a new T-42 combat vehicle and other units. At least that was the plan established early last month. The sudden cancellation of war production schedules has knocked this arrangement into a cocked hat and will require some hasty reshuffling to accommodate it to the revised picture resulting from termination of the war. As expected, one of the first steps following cessation of hostilities has been abandonment of the limited passenger car allotments formerly in effect.

Recent Production Limited

The foundry has been in limited production on gray iron since last fall, operating but one of the six cupolas. Principal products were tank castings and heads and blocks for Hercules diesel truck and invasion craft engines. The latter job finally was completed and proved to be one of the worst headaches Buick foundry engineers ever tackled. Scrap losses at times ran to an excessive percentage and the job of running down the explanations taxed the patience and ingenuity of Superintendent Bill Mixer and his staff. Some of the trouble stemmed from the design of the block; other difficulties arose from such apparent inconsequentials as seams and laps in chaplet wire.

By sheer perseverance, most of the shop pains in connection with the Hercules job were finally licked, but the supervisory staff must have breathed a sigh of relief when the program was concluded.

Equipment changes made in the foundry in recent weeks, preparatory to the resumption of automotive production, practically all stem from a determination to improve working conditions, lessen manual effort and in general doing everything possible to overcome the poor reputations which foundries seem to have acquired in recent years as places to work. These installations should pay off in the form of a better grade of labor, improved productivity and fewer grievances over working conditions.

For example, each of the six cupolas has now been fitted with a special type of dust collecting "cap" designed by Buick engineers and installed by outside contractors, which by reversing the direction of waste gases and fumes and scrubbing them with water sprays effectively removes the dirt and iron oxide contained therein. Some months ago one of the cupolas was fitted with one of these devices, and experienced dust collection engineers shook their heads, saying it would never work. They were pleasantly surprised, for it succeeded beyond expectations in cleaning waste gases with no interference to cupola operation. Immediately five more units, with slight modifications in construction were ordered and all are now in place, ready for cupolas to be lighted. THE FOUNDRY will present a detailed report on the installation in an early issue.

New Pouring Station Platforms

Taking a cue from an installation at the Pontiac foundry, Buick installed traveling platforms at pouring stations on several lines, so that operators handling ladles move ahead at the same speed as the mold conveyor, thus greatly easing the task of filling molds properly. Exhaust hoods and fans also have been installed over the conveyor lines at these points. At shakeout stations, new dust collectors of the water cascade type have been erected, taking much of the dirt away from this usually noxious task.

Looking for further means to lower production costs in the coreroom over former hand ramming methods, consideration was given by engineers to the possibility of blowing cylinder barrel cores and after some study in co-operation with equipment interests a system was worked out, involving a central coreblowing machine co-ordinated with two closed conveyor loops around it which automatically index with the operations of the machine. One of the units was installed for the Hercules job and after some modification proved highly successful in producing better cores in far less time and with considerably less labor. Per man productivity is four or five times former methods and resulting cores show no sag or other imperfections often arising in hand ramming. Two more of the coreblowing units now have been installed.

The principal difficulty was in selling the system to the working force which followed the usual practice of condemning the machine because of the alleged "backbreaking" work it required, when the real reason was that its use meant production of cores in a fraction of the time required formerly, and with fewer men. After considerable bickering, night gang decided really to "go to town" one night and surprised themselves with the number of cores produced. This, of course, meant more money for the entire crew, and it was not long before other shifts realized the economic futility of trying to slow down the machine.

Additional Space Provided

Additional space has been provided at the Buick foundry by roofing over an area between two other buildings. Equipment and conveyors now are being relocated in this section, which will free other more crowded departments. At one end of the new area, a well equipped first aid and hospital station has been installed, with all the latest equipment for treating injuries and caring for other emergencies. Plans call for the early construction of a new office and laboratory building adjoining the gray iron foundry. The foundry staff now maintains offices in the aluminum foundry, which is some distance away, but from all indications this property will be abandoned when production ceases. It is already down to something like 12 per cent of capacity.

Despite the fact it operates four large automotive foundries in Michigan, all of which are currently being expanded, General Motors reportedly is in the market for several thousand tons of gray iron monthly for some of its divisions which do not have captive foundries. Taking cognizance of this fact and realizing other manufacturers doubtless are drawing similar plans for expanded production, some observers here see an early shortage of gray iron foundry capacity. Of course, there are other sections of the country to draw from, and cancellation of war contracts may render the problem nonexistent, but at least it is being scouted.

It will be interesting to watch the

(*Concluded on page* 138)

Large billets are uniformly heated in this EF Rotary.

The above EF Oil Fired Rotary . . .

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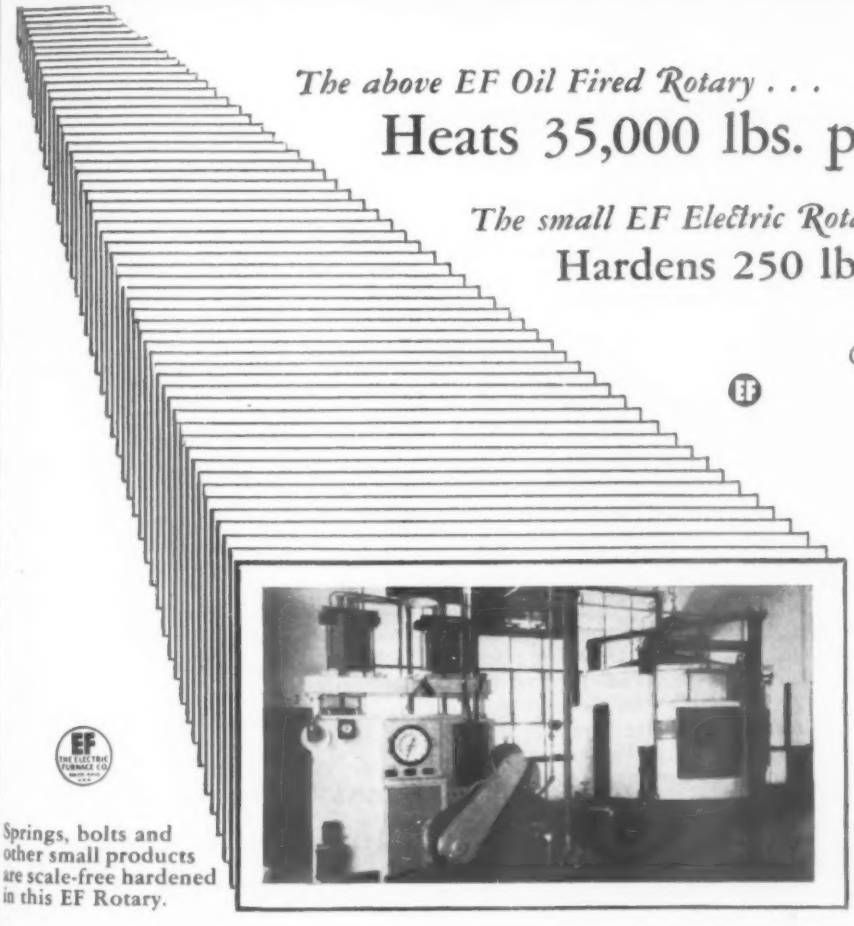
The small EF Electric Rotary below . . .

Hardens 250 lbs. per Hour—*Scale Free!*



Springs, bolts and other small products are scale-free hardened in this EF Rotary.

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Gas Fired, Oil Fired and Electric Furnaces---For Any Process, Product or Production

(*Concluded from page 136*)

attitude of labor following the unemployment which is bound to result from termination of the Japanese war and the large-scale lopping off of war contracts which by law must follow immediately. July and early August were truly dog days in most foundries. Many reported widespread and repeated absenteeism, some only averaging about one day out of two, making the maintenance of any semblance of production at all a remarkable achievement.

It will be no simple matter to work out the details of rescheduling civilian production to take up the slack left by cancellation of $50 billions of war production. Estimates range from three to six months as the time required to digest such a change. Meanwhile extensive unemployment seems unavoidable. Whether this will bring a change in the willingness of the average worker to remain on the job and offer a reasonable amount of effort in a day's work remains the $64 question.

Foundry of Kelsey-Hayes Wheel Co. in Detroit has taken a new lease on life following its virtual abandonment upon conclusion of a contract for supplying cast tank turrets. At that time, much of the foundry's equipment was uprooted and machine tools installed for processing aircraft engine components. Now, however, the foundry is again in production, at least in a preliminary way, turning out centrifugally cast brake drums for Ford.

Iron is melted in a cupola, then transferred to a small electric furnace for refining and superheating. It is then moved to "spinners" by ladles, being accurately measured so that each spinner receives an identical amount of iron. The spinners are separate units mounted around a turntable somewhat similar to the installation at Centrifuse Corp. in Lansing. Pressed steel rings are fitted into the spinner housings, locked in place, the iron poured in after motors start the rings whirling, and by the time the table has made one revolution the iron has set and the drum can be removed from the housing. Single drums are made in each spinning unit, in contrast to Centrifuse, where double drums were spun and then machined apart.

Kelsey-Hayes is experimenting with a different type of spinning unit resembling a ferris wheel; that is, the entire turntable unit is turned up on edge so that the central shaft is horizontal instead of vertical. The spinners are charged as they reach floor level, traveling around the wheel to a discharge point. It is not known what the particular advantages of such an arrangement may be; but one could be conservation of floor space.

Large requirements for gray iron castings are involved in the commercial truck program. Authorization has been given by the WPB for production of over half a million trucks during the last half of this year, all but 188,000 receiving priority assistance on materials. Bulk of the program covers light and medium trucks and commercial cars for civilian use. Ford, Chevrolet, Dodge, General Motors Truck and International Harvester carry the major parts of the assignment.

Short Course Covers Health Hazards

The School of Public Health, University of Michigan, is offering a short course on Oct. 2, 3 and 4 in environmental controls for industrial processes which will include discussion of ventilation applied to foundry operations and consideration of health hazards in welding and flame cutting processes. Information may be secured by addressing the School of Public Health at Ann Arbor, Mich.

Iron Welding Rods Used as Core Arbors

By T. E. JOHNSON, Burgess-Parr Co., Freeport, Ill.

IN MANY foundries the casting of small diameter sleeves in lengths over 10" or 12" is rated a high risk job; that is, the percentage of rejected castings is usually quite high. Frequently the cause of rejection may be traced to bowing of the internal core, which in turn results in a cast sleeve of uneven wall thickness. This problem is perhaps more pronounced in casting the higher melting point nickel alloys and steels, as the conventional type of steel core wire used to reinforce the baked sand core loses its rigidity very rapidly at elevated temperatures and thus permits the core to sag when the molten metal is cast.

Our foundry has solved this problem quite effectively in casting the high nickel corrosion resistant alloy Illium. Cast iron welding rods are used as core rods or arbors in place of steel core wire. The cast iron retains its strength at the elevated temperatures to which the cores are subjected. Our core makers prefer rods of square cross sections in sizes ranging from ⅛" square to ½" square, depending upon the diameter and length of the internal core. When making two part cores, a rod is placed in each half and the rigidity is increased somewhat by tying the rods together when the core is pasted.

This application of cast iron welding rod has proved to be economical, the original cost of the welding rod is relatively small, and the individual rods are salvaged from the burnt cores and reused.

OBITUARY

ERNEST N. VAN BILLIARD, 44, vice president and treasurer, Progressive Foundry Works Inc., Rochester, N. Y., died July 26. Mr. Van Billiard was a member of the AFA and recently was elected a director of the Rochester Chapter.

• • •

John T. Booth, 67, superintendent of the annealing department in the Cleveland plant, National Malleable & Steel Castings Co., died July 29 in that city. Mr. Booth worked for the Toledo, O., plant of National Malleable, built in 1890 under the supervision of his father, the late George H. Booth. He was transferred to Cleveland in 1927. He was an active member of the Northeastern Ohio Chapter of the AFA.

• • •

Henry Held, 67, president of the Rundle Mfg. Co., Milwaukee, for 20 years, died July 13 at his home in that city. Mr. Held was also chairman of the board of directors, Milwaukee Flush Valve Co., Milwaukee. He retired three years ago.

• • •

Edward J. Morisse, 82, assistant secretary of the Badger Malleable & Mfg. Co., South Milwaukee, Wis., until two years ago, died there July 29. Mr. Morisse had been in the foundry business for the last 60 years. He was first employed by the Moore Mfg. & Foundry Co., and later worked with the Stowell Mfg. Co. for several years.

• • •

Neil I. McArthur, 55, vice president, Great Lakes Foundry Sand Co., Detroit, died July 24, in Charlevoix, Mich. Mr. McArthur was active in the old Detroit Foundrymen's Association and was secretary of that organization at the time of the annual AFA convention at Detroit in 1932.

• • •

John B. Berryman, 83, chairman, Crane Co., Chicago, died Aug. 11 in that city. He had been associated with the company 53 years. Made secretary in 1911, Mr. Berryman became first vice president in 1914, president in 1932, and chairman in 1935.

• • •

John E. Thomas, 57, managing director, Canedy-Otto Mfg. Co., Chicago Heights, Ill., died July 19 in Chicago.

Cast Iron in the Chemical Field

Gray Iron Founders' Society, 1010 Public Square building, Cleveland 13, recently has published a 27-page brochure on "Cast Iron in the Chemical and Process Industries," by F. L. La Que. It discusses the reasons why cast iron is chosen for those applications and contains extensive tables showing the resistance of cast iron to various chemical solutions. Copies of the brochure may be obtained for $1 each.

A Combination of Two Bond Clays May Be Better Than One

¶ Dixie Bond added to Revivo Bond increases permeability.

¶ Dixie Bond added to Black Hills Bentonite gives better flowability and easier shakeout.

¶ Balanced Revivo added to any other bond stops cuts, washes and scabs.

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¶ Are you puzzled as to what type Bond Clay to use?

¶ Do you feel that your present sand practice could be improved?

¶ Do you have any particular scrap defect?

¶ That isn't all, of course. With a range of products and, consequently, no need to push any one of those products where it does not belong, ECP is in a position to give you unbiased, result-getting counsel.

Remember, please, that ECP service engineers have *five* different bonding clays and their many combinations from which to give you the one right recommendation and to assure you of receiving the *most bonding strength per dollar.*

EASTERN CLAY PRODUCTS, INC., EIFORT, OHIO

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DIXIE BOND • BLACK HILLS BENTONITE • REVIVO BOND • REVIVO SUPER BOND • BALANCED REVIVO

All TYPES OF BONDING CLAYS

A Foundry Sand Service Based Upon Practical Research

NO CRACKS, NO BLISTERS, NO PEELING ON MOLDS SPRAYED WITH MEXACOTE

Mixed into a paste, then thinned with water to 40°-60° Baume, Mexacote sprayed on molds hits a new high in mold wash efficiency. The surface may be quickly dried, immediately after application, with a blow torch and no matter how severe the torching, it will not crack, shrink, scab, peel, or buckle. Mexacote is versatile—may be used on all kinds of green or dry sand or loam molds. Mexacote is fire proof—it contains no hazardous volatile matter. Mexacote saves time—it helps insure smooth, clean, castings and thus eliminates much of the usual cleaning. Mexacote is the all purpose blacking—equally effective on either molds or cores. When dipping cores apply at 35° Baume; when spraying, apply at 25° Baume. .

In spite of its effectiveness, speed of application and improvement of casting quality, Mexacote costs less than other mold or core washes. If you are interested in improving your casting surfaces, saving time and cutting your foundry costs write us today for complete facts.

Mexacote

THE UNITED STATES GRAPHITE COMPANY • SAGINAW, MICHIGAN

COMPILED CHART OF NAVY SPECIFICATIONS FOR CAST FERROUS ALLOYS

(From the Foundry Manual, U. S. Navy Bureau of Ships)

Spec. No.	Material	Class or Grade	Requirements: Chemical composition per cent maximum or range indicated										Physical requirements, minimum						Uses
			C	Mn	P	S	Si	Cu	Ni	Mo	Cr	Se	Tensile p.s.i.	Yield point p.s.i.	Elon. % in 2"	R.A. %	Cold bend deg.	Bhn 3,000 Kg.	
49S1	Steel castings	A	0.50		0.05	0.06							80,000	40,000	17	25	Not req'd		For all important parts subject to crushing stresses and surface wear—Hawse pipes, chain pipes, engine guides, and slippers.
		[5]B	[1]0.30	[1]0.60	0.05	0.06	0.20-0.60	0.30	0.50	0.20	0.20		60,000	30,000	24	35	120		For fabrication by welding or welding to in erection or service when subsequent heat treatment is impracticable. When used for parts requiring dimensional stability castings should be stress relieved after welding. For parts subject to severe vibratory or shock stresses—eng. bed plates, cyl. housings, bearing caps, stern tubes, struts, etc.
		C	0.45	1.00	0.07	0.08							[2]55,000	[2]27,000	[2]15	[2]25	Not req'd		For applications where strength is not of prime importance and where welding quality is not required.
		Cw	0.30	0.70	0.07	0.06							[2]55,000	[2]27,000	[2]15	[2]25	Not req'd		For applications where strength is not of prime importance but where welding may be required.
		D	[7]0.35	[7]0.70	0.05	0.06	0.45	0.50	[8]1.00	Other elements (each) .25			[11]70,000	[11]40,000	[11]24	[11]30	[11]120		For the same general purpose as class B castings but where greater strength is desired. May be welded if stress relieved after welding.
		[4]F			0.05	0.05							85,000	53,000	22	35	120		For use where properties required are not obtainable in other grades as gun yokes, stands, carriages, and deck plugs.
46S33	Steel, moly.	A	[1]0.25	0.50-0.70	0.05	0.05	0.20-0.50	[5]0.30	[5]1.00	0.40-0.60	[5]0.20		65,000	35,000	20	30	120		For castings intended for use with superheated steam at temp's. of 650 F or above and for certain high pressure hydraulic services.
46S27	Steel, corrosion resisting	1	[6]0.07		0.05	0.05			[6]8.00		[6]18.00		70,000	[9]40% tensile	35	40			For uses where subject to severe corrosion—chemical limitations presuppose welding.
		7	[6]0.07		0.17	0.05			[6]8.00		[6]18.00	0.20-0.35	70,000	[9]40% tensile	35	40			Nonseizing type—specify for one of a pair of mating parts in threaded or working parts—avoid welding.
4615	Iron, gray high test castings	A			0.20	0.12							30,000					[10]250	All 4 classes used for a high test cast iron for general and diesel engine work such as air compressor cylinders, working cylinders, pistons, cylinder heads, bed plates, engine housings, sole plates, piston rings, bull rings, liners, inlet, exhaust valves—use class specified on drawings.
		B			0.20	0.12							35,000					[10]260	
		C			0.20	0.12							40,000					[10]270	
		D			0.20	0.12							45,000					[10]280	
4616	Iron, gray castings	A				0.12							18,000						Light castings having a section less than 1/2-in. thick.
		B				0.12							21,000						Medium castings having sections ranging from 1/2-in. up to, but not including, 2 in. thickness.
		C				0.12							24,000						Heavy castings having no section less than 2 in. thickness.
4619	Iron, gray scale-resisting		2.6-3.0	0.80-1.30	0.20	0.10	1.25-2.2	5.0-7.0	12.0-15.0		2.0-3.5		25,000					120-180	Resists corrosion in acid, caustic and salt solutions. Used for handling conc. brine solutions.

1 For each reduction of 0.01 per cent c under the max. specified, an increase of 0.04 per cent Mn above the max. specified will be permitted.

2 Physical prop. not required. Properties listed may be considered typical for design purposes.

3 Permissible residual amt's. for Mo, Cu, Ni, Cr listed shall not be added.

4 Castings with other physical requirements may be specified on plans.

5 Limits for Cu, Ni, Cr are permissible residual elem. & shall not be added.

6 If Cr is over 20 per cent & Ni is over 10 per cent a max. C content of 0.12 per cent will be permitted.

7 For each reduction of 0.01 per cent C from the maximum of .035 per cent, an increase of 0.025 per cent Mn above 0.70 per cent will be permitted.

8 For ordnance castings, 1.5 per cent Ni will be permitted.

9 Determine yield pt. by means of dividers. Cold bend through 150° around a pin 1½ times the thickness of the specification, without fracture.

10 Maximum.

11 Shall apply to castings weighing 5,000 lb. and less.

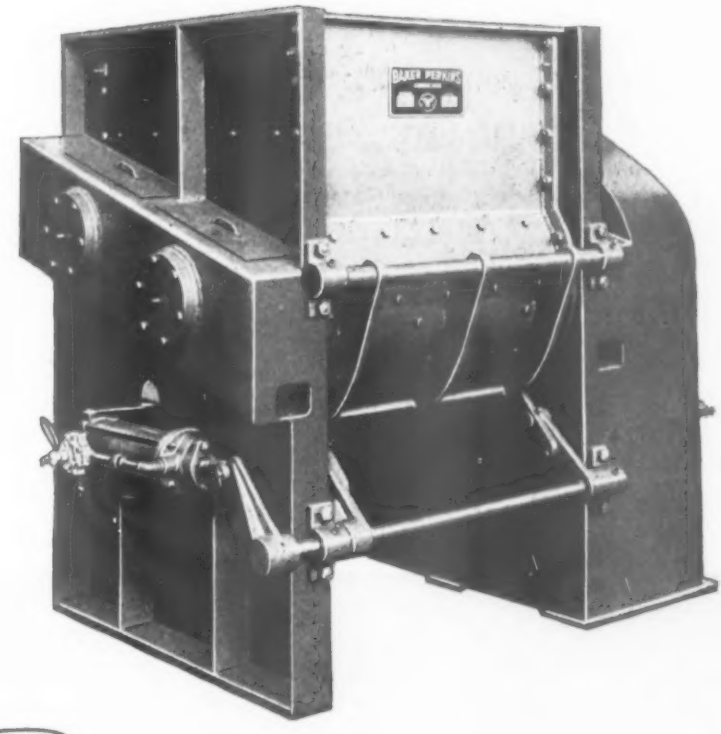
COMPILED CHART OF NAVY SPECIFICATIONS FOR CAST NONFERROUS ALLOYS

(From the Foundry Manual, U. S. Navy Bureau of Ships)

Spec. No.	Material	Class or grade	Requirements: Chemical composition per cent maximum or range indicated								Physical requirements (min.)			Uses
			Cu	Sn	Zn	Pb	Fe (max.)	Ni (max.)	P (max.)	Al	Mn	Tensile p.s.i.	Yield point p.s.i.	Elongation percent in 2 inches	
46B8	Bronze, valve (Comp. M): Castings		86.5-90.0	5.5-6.5	3.0-5.0	1.0-2.0	0.25	1.00	0.05			34,000		22.0	High-grade valve bronze suitable for valves, manifolds, and cocks. A general-purpose bronze, used for parts not highly stressed and where corrosion resistance is requisite, such as low and medium pressure valves; castings for stern tube and propeller shaft sleeves, manifolds, hose couplings and fittings, and cocks. Should be used in lieu of Composition G (N.D. Spec. 46M6) wherever the physical properties permit. This alloy should not be used where the temperature of the metal may exceed 425 F.
46M6	Metal, gun (Comp. G): Castings		86.0-89.0	7.5-9.0	3-5	0-0.30	0.15	1.00	0.05			40,000		20.0	Excellent steam and structural bronze, and may be used for expansion joints, pipe fittings, gears, bolts, nuts, valves, pump pistons, plungers, casings, bushings, bearings, and, in general, where good strength and resistance to salt-water corrosion are required. Bearings to resist severe impacts and vibration. Castings subjected to moderate liquid or gas pressures. Intended for all parts requiring medium strength and resistance to salt-water corrosion, such as composition valves, gear wheels, miscellaneous castings, and for all purposes where no other alloy is specified, and design will permit. Composition valves: safety and relief, feed check and stop, surface blow, drain, air, and water cocks, main stop, throttle reducing, sea, safety sluice and pump manifolds. Heads, shapes, and water chests. Condenser, distilling condenser, feed-water heater, oil cooler. Pumps: Airpump casing, valve seats, buckets, main circulating water cylinders, valve boxes, water pistons, stuffing boxes, followers, glands, and in general, the water end of pumps complete, except as specified. Stuffing boxes: glands, bushings for iron or steel boxes. Blowers: bearing boxes. Journal boxes: Distance pieces. Miscellaneous: Grease extractors, steam strainers, separators, propeller hub and caps. Bearings: main, stern tube, strut and spring. Spring bearings: glands and baffles. Reciprocating engines: crossbead brasses, crankpin brasses, eccentric straps, and distance pieces. Note—This is a general-purpose composition, but is not to be permitted where the temperature of the metal may exceed 425 F.
46B23	Bronze, hydraulic (Ounce metal) (Oz-c): Castings		84.0-86.0	4.0-6.0	4.0-6.0	4.0-6.0	0.30	1.00	0.05			30,000		20.0	Standard composition for general service, also known as red brass. It is satisfactory for use with pressures up to 350 lbs. Miscellaneous castings not of a bearing nature.
49B3	Bronze, manganese, (Comp. Mn-c) Castings		55-60	1.00 (max.)	Remainder	0.40 (max.)	0.40-2.0			0.50-1.50	1.50 (max.)	65,000		20.0	For use for castings, such as propeller hubs, propeller blades, engine framing, gears, worm wheels, torpedo spoons, torpedo tube castings, gun mount castings, etc., where strength, toughness, or resistance to corrosion of sea water is required. Relatively high tensile, medium elongation bronze, highly resistant to salt-water corrosion; used where strength and corrosion resistance are primary requirements, such as propeller blades and hubs, worm wheels, and framing. Not satisfactory for temperatures above 425 F. This alloy containing a minimum of 0.50 per cent tin has superior resistance to corrosion by dezincification, and this percentage of tin should be contained in this bronze when the purpose for which it is to be used requires maximum resistance to dezincification.
46B31	Brass castings		59-63	1.00 (max.) (Mn, Sn, Ni, Fe and Pb)	Remainder	0.20 (max.) Other elements (each)				0.50-1.00		55,000		25.0	For use for torpedo tubing castings, and other applications where strength, toughness, and/or moderate resistance to corrosion is required.
46B10	Brass, naval (Comp. N-c): Castings		60-65	0.5-1.5	Remainder	0.75-1.5	0.75			0.5 (max.)		30,000		15.0	For such uses as: latch frames, hatch-cover frames, door frames, scuttle frames, fittings for mess tables and benches; skylight and chest hinges and fittings; all joinerwork fittings (except hardware); rail and ladder stanchions; brackets, clips, etc., for storage purposes, fittings for canopy frames; all brass valves and fittings for ventilation system (except working parts); belaying pins, tarpaulin hooks, brass hatch and door fittings, brass-pipe flanges. Low tensile strength and elongation; used as a general-purpose brass, being relatively less affected by corrosion than commercial brass; used for handwheels and fittings in general not subjected to pressure.
46B11	Brass, commercial: Castings	I	65-70	1.50 (max.)	Remainder	1.50-3.0	0.75			0.30					For use for castings that are not to be subjected to water or air pressure, and where iron or steel is unsuitable because of its corrodibility, such as instrument cases, oil cups, distribution boxes, and trimmings. Commercial brass will machine with greater facility than naval brass because of its higher lead content, but its physical properties are much lower. It is used for nameplates, handrail fittings, instrument cases, oil cups, trim, and fittings in general where cheap brass will serve the purpose, and strength and resistance to corrosion are not important.
		II	70-74	0.75-2.0	Remainder	1.50-3.5	0.60								
46M1	Nickel-copper Alloy, Castings		23.0 (min.)			2.0 C and Si combined (max.)	3.5	60.0 (min.)		0.5 (max.)	3.5 (max.)	65,000	32,500	25.0	For use as valve fittings, boat fittings, propellers, propeller hubs and blades, engine framing, pump liners, valve seats, shaft nuts and caps, and other parts requiring great strength and high resistance to corrosion. Known as "Monel metal", or equivalent; medium tensile, high elongation, extra high corrosion-resisting alloys, maintaining their strength satisfactorily to 800 F; used where high corrosion resistance or strength at elevated temperatures are requisites, such as high-pressure valves, valve trim and fittings, and shaft nuts and caps.
46N7	Nickel-copper silicon alloy, Castings	A	Remainder		3.0-4.0 Si (max.)	0.30 C (max.)	3.0	62-68		0.5	0.50-1.00	100,000	65,000	10.0*	Class A castings are intended for propellers.
		B	Remainder		3.0-5.0 Si (max.)	0.30 C (max.)	3.0	62-68		0.5	0.50-1.00			†	Class B castings are intended for use where nongalling and anti-seizing characteristics are desired. Both classes have good corrosion resistance.
46A1	Aluminum alloy, Castings (sand)	2	0.1 (max.)	0.05 Other elements (each)	0.30 (max.)	4.5-6.0 Si	0.8 (max.)	0.2 Ti (max.)	0.05 Mg (max.)	Remainder	0.30 (max.)	17,000	9,000	3.0††	Low tensile, for use when high strength is not a factor and where good resistance to salt-water corrosion is necessary. No heat treatment required. Tensile and yield strengths are somewhat lower than those of the aluminum-copper alloys, but it is appreciably more ductile and resistant to shock. Used as architectural and ornamental castings, and practically all kinds of marine castings because of its satisfactory performance in salt-laden atmospheres. For castings in which foundry properties and resistance to corrosion are more important than strength or stiffness.

*-BHN 300 (3000 Kg.) †-BHN 300 (3000 Kg.) ††-BHN 40 (500 Kg.)

WHAT THEY SAY ABOUT BAKER PERKINS CORE SAND MIXERS



Workmen who operate them like the simple, labor-saving operation of Baker Perkins "Unidor" Core Sand Mixers. Baker Perkins Mixers mull, stir, and knead all in one operation, and they do not require any special aerating attachments. Result? They consistently produce sand batches of uniformly high quality with a minimum of labor.

Production Men rely on Baker Perkins "Unidor" Mixers because their swift action in preparing core sand gets any job of casting off to a flying start. They help assure uninterrupted foundry production because they deliver a thorough, homogeneous sand mix of greater permeability which improves casting quality and reduces chances of spoilage. "Unidor" Mixers can be loaded by weighing hoppers or power skip-hoists to suit the production set-up.

Foundry Managers endorse Baker Perkins "Unidor" Mixers because their high operating efficiency means a savings in production costs without sacrificing casting quality. "Unidor" Mixers distribute uniformly a thin layer of bond around each of the sand grains, assuring 100% benefit from the bonds, binders, oils, seal coals, pitch, or other compounds used. "Unidor" Mixers require practically no maintenance other than routine lubrication and occasional renewal of easily replacable steel liners and hardened steel wearing shoes. For further facts call or write Baker Perkins Inc., Foundry Equipment Sales Division, Saginaw, Michigan.

BAKER PERKINS BUILDS EFFICIENT FOUNDRY EQUIPMENT

THE FOUNDRY DATA SHEET SEPTEMBER, 1945
COMPILED CHART OF NAVY SPECIFICATIONS FOR

foundry DEVELOPMENTS

NOVEL method to try and ascertain what occurs during cupola operation was applied in Great Britain. Work was conducted on a 42-in. cupola which was operated for about 3½ hr on regular charges. Then specially prepared charges of iron and coke as well as special test pieces were placed in the cupola. Cupola continued to operate for an hour longer when the blast was cut off, and then the charges in the shaft were quenched by admitting water at the rate of 1000 gal per hr from a cone spray about 2 ft above the charging sill. Next day charges were stripped from the cupola and observations made of their conditions. It was found that the metallic charges did not descend as originally placed but followed the path of least resistance. In the lower part of the cupola there is a tendency for all materials to move toward the center which is attributed to formation of a *slag ledge* immediately above the tuyeres. Coke size gradually decreased as charges descended. Reduction in size was not uniform on the horizontal plane as coke in center was reduced most while that against the wall remained almost unaffected. Examination of special steel test pieces included with charges indicates that carbon is absorbed by the outer surface which melts off, and that process continues until the piece disappears.

° ° °

TAP carbon analysis has been speeded up considerably at National Works of National Tube Co. by a novel sampling procedure now in standard use at several United States Steel Corp. subsidiary plants. Procedure consists of taking a test spoonful of slag-free metal from the bath, killing the steel with aluminum wire and drawing a column of approximately 6 in. of clean steel up into a 6 mm pyrex glass tube by means of a 1-oz rubber bulb. Caution must be exercised to assure that no slag covers the surface from which the sample is drawn and that no time is lost between withdrawing the spoon from the bath and taking the glass tube sample. The sample is quenched in water, the glass broken from the steel and a test piece ¾-in long sheared from the center of the rod by wire clippers. This test piece is weighed directly and fused under standard conditions in a high temperature combustion furnace for carbon determination. The entire process requires approximately 12 min.

The test piece is ideal for carbon analysis since it is free from scale, segregation, and pipe. Experience with the new test shows a substantial saving in furnace time after a heat has been "blocked" and an improvement in the control of ladle carbon analysis. Patent applications have been filed covering the new test and procedure.

° ° °

THERMIT welding process has been adapted to the production of steel castings. As in making thermit welds, the finely divided aluminum and iron oxide are ignited in a crucible. The molten metal then is poured into a mold after cooling somewhat from the peak temperature of 4000 F. A typical steel made by this method showed 0.25 per cent C, 0.68 per cent Mn, 0.11 per cent Si, 0.60 per cent Al, 0.02-0.04 per cent S, and 0.02-0.04 per cent P.

° ° °

REPLACING an old and worn rope with a new one on any machine which requires pulling the new rope through blocks, over sheaves and on to drums often tries the temper sorely. However, the operation can be performed with comparative ease by the following procedure, provided the rope is the preformed type. From the end of the old rope, unlay and remove four of the six strands for a distance of 2 to 3 ft. Similarly remove two of the six strands from the new rope to be installed. Splice or more properly "lay" the two together and tape the ends to prevent unravelling. That will permit the new cable to be pulled through the blocks and pulleys, and reeved rapidly, accurately and easily.

° ° °

LIVES there a foundryman who some time or other did not wish that he possessed comic strip Superman's extraordinary x-ray eye with which he could peer into the vitals of a mold and observe what occurs as the molten metal fills the casting cavity? Possibly he might be amazed to hear that developments have progressed to a point where that phenomenon is nearly an accomplished fact. Experimental work in England with photography of the shadowgraph projected by x-rays on a fluorescent screen led to a procedure for examining what takes place when a sand mold is filled with molten metal. Preliminary information was gathered with molten lead and then with aluminum alloys using single exposures. Since the latter could not be made rapidly enough the motion picture camera was substituted. While the method as yet has not reached the point where the film may be projected when taken at 64 frames per second due to the variations in light intensity, projection of film taken at normal rate of 16 frames appears like direct observation of fluorescent screen. However, preferred method at present is to make prints of 5 frames each. E.B.

White hot steel drawn up into a glass tube approximately ¼-in. diameter forms the test specimen from which a section is cut for determination of carbon content

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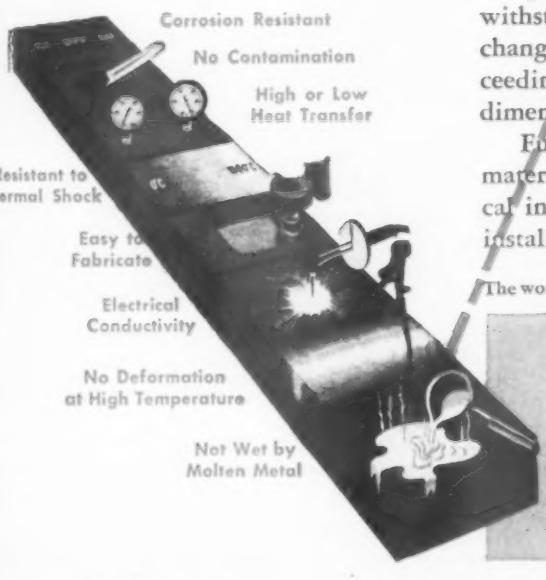
Graphite's very low coefficient of thermal expansion—.0000015 per °F—explains why some graphite molds for ferrous and non-ferrous metals withstand several thousand pours without longitudinal or cross-sectional change. Graphite electronic tube components, at temperatures far exceeding operational requirements, maintain an unmatched degree of dimensional stability.

Furthermore, "National" Carbon and Graphite are available as porous materials or in the form of "Karbate" impervious products for the chemical industries. We invite your inquiries on the many applications and installations of these highly versatile materials of construction.

BAR OF WHAT?

Carbon, Graphite or "Karbate" materials, of course!



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Unit of Union Carbide and Carbon Corporation

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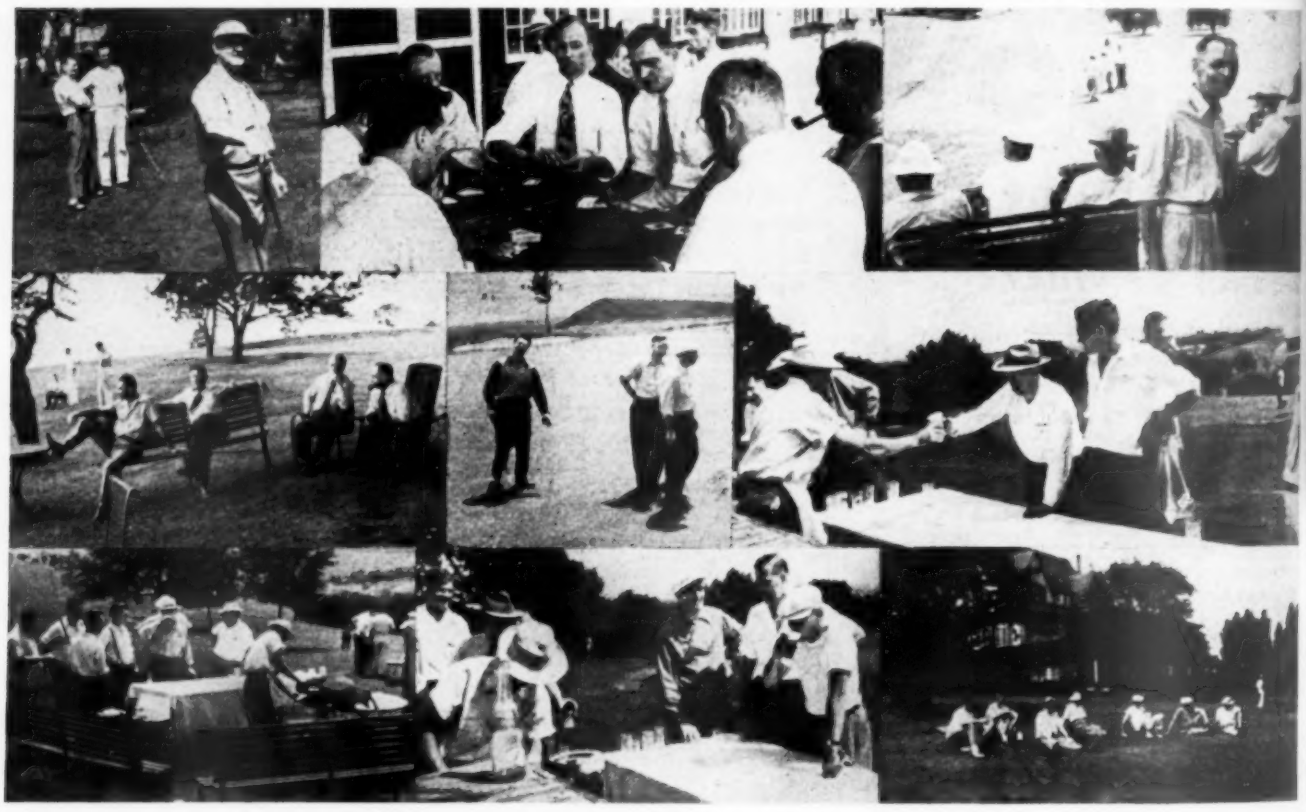
WESTERN NEW YORK: Reinhold D. Loesch, Lake Erie Foundry Co., Buffalo, presents the gavel to Arthur H. Suckow, Symington-Gould Corp., Depew, N. Y., as chairmanship of the Western New York Chapter, AFA, changes hands. Also shown at the chapter's annual meeting and election of officers are other officers and directors of the group. (Photo courtesy Jack Heysel, E. J. Woodison Co., Buffalo)

Offers Magnesium to Universities

Defense Plant Corp. has sent letters to 160 universities offering them up to 200 pounds of pure magnesium ingot for experimental work. No restrictions were placed on the use of the metal except that reports be made to DPC of findings in experiments dealing with the following main subjects: Corrosion; covering or coating of paint or like surface treatment for finished magnesium products; machinability, and creation of new alloys. Committee designated to study the reports to DPC include E. S. Bunn, Revere Copper & Brass Inc., Halethorpe, Md.; Wiser Brown, American Magnesium Corp., Cleveland; E. S. Christiansen, Magnesium Co. of America, Chicago; A. Cristello, Bendix Aviation Corp., Bendix, N. J.; Dr. J. D. Hanawalt, Dow Chemical Co., Midland, Mich.; W. H. Mutchler, National Bureau of Standards, Washington, and E. W. Rouse, Revere Copper & Brass Inc., New York.

Describes Facilities

Chicago Hardware Foundry Co. has published a bulletin describing its facilities for the production of gray iron, alloy iron, brass, bronze and aluminum castings at its North Chicago, Ill., and Elkhart, Ind. plant. In addition to these facilities, the booklet indicates the company has available the services of a machine shop and a porcelain enameling plant. Special stress is laid on the fact that the plant has been in operation since 1897.



PITTSBURGH FOUNDRYMEN: Approximately 500 members and guests of the Pittsburgh Foundrymen's Association enjoyed an afternoon of golf and an evening of entertainment at the group's annual golf party, held at the Alcoma Country Club, June 26. The entertainment committee, which was largely responsible for success of the affair, included John H. Buchanan, Hickman Williams & Co., chairman; Alfred W. Protheroe, Vesuvius Crucible Co., and Day E. Cutler, J. S. McCormick Co.

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WITH THE EDITOR

UNDOUBTEDLY, the transition of the foundry industry from war to peace should be easier than the task which confronted it in 1941-1942. Shortages of raw materials and tools, and the confusion in Washington, were the two factors which interfered most with accelerated production for war in the early days of the emergency.

Theoretically, the problem of reconversion consists of substituting patterns for various types and classes of castings needed for civilian production for those which have been produced during the past few years for the war effort, securing the necessary flasks and equipment to handle these patterns, and turning out castings in the required quantities.

One factor, not present in 1941-1942, now may slow down reconversion. After 3½ years of war production, with early shortages of materials and more recent shortages of labor, with government red tape, indecision, unreasonable demands and the large amount of extra work required just to keep the business in operation, management and supervision have become weary and undoubtedly need a rest. The incentive to drive ahead, which played such an important part in successful reconversion to war, will not be present as long as the government continues to exercise the type of bureaucratic control illustrated by the OPA, the War Labor Board, the War Manpower Commission, and the Military Services.

Foundrymen produced castings for war in spite of the handicap provided by the government. That same incentive will not be present to drive ahead in the early postwar period if these government handicaps are not removed.

• • •

THE FOLLOWING news release by the War Production Board should be interesting to both gray iron and aluminum foundries:

The use of aluminum as a substitute for gray iron castings for motor end brackets has been recommended by the War Production Board to manufacturers of fractional horsepower motors. Fractional horsepower motors are one of the items in critically short supply, WPB explained. Motor manufacturers have reported difficulty in obtaining components, gray iron castings being one of their particular bottlenecks.

The shortage in gray iron castings, WPB has pointed out to the motor manufacturers, will continue. Requirements are going up, and the supply does not appear to be gaining because working conditions in the foundries impair production in the summer. This situation will improve with cool weather but the shortage is expected to persist.

WPB has advised the industry, in light of urgent need for fractional horsepower motors in both reconversion and military programs, to investigate other solutions to their problem. Several companies, WPB said, are working with aluminum, which offers good long-range possibilities as well as immediate help.

A list of aluminum foundries now having open capacities has been sent the motor manufacturers. It is not a complete list, WPB said, and other foundries will open as aircraft cuts continue and the situation on sand and permold aluminum castings becomes easier.

The list of aluminum companies sent motor manufacturers follows: Aluminum Alloys Co., Detroit; Ebaloy Foundries, Rockford, Ill.; General Malleable Co., Waukesha, Wis.; Hampden Brass, Springfield, Mass.; John Harsch Corp., Cleveland; Metal and Alloy Specialties, Buffalo; Metal Parts Corp., Racine, Wis.; Oberdorfer Foundries, Syracuse, N. Y.; Peerless Foundry, Bridgeport, Conn.; Wolf & Dungey, Syracuse, N. Y. F.G.S.

PRECISION MEASURING: A new measuring instrument having a precision never yet demanded by industry has been developed at Battelle Memorial Institute, Columbus, O. Using the principle of frequency modulation radio, the instrument can measure movements or changes in position as small as one-tenth of a millionth of an inch. Gerard M. Foley, Battelle physicist, is shown using the micrometer to measure the precision of lathe spindles

Book Review

Principio to Wheeling, a pageant of iron and steel, by Earl Chapin May, 335 pages, published by Harper & Brothers, 49 East 33rd Street, New York, price $3.00

Foundrymen with a flair for the historical will find this book most interesting. The author has dug into new and interesting documents and the story covers the period from 1715—1945, dramatizing the nation's history through the story of Principio Furnace, Maryland, and how it became the Wheeling Steel Corp.

The story begins with the struggles of early English investors to establish an iron industry on the shores of Chesapeake bay, where there were ore deposits sufficient for the needs of that time. Joseph Farmer who came from England in 1715, decided to establish a furnace there to supply a need for iron in England where dwindling charcoal supplies had forced the purchase of iron from European competitors. The story points out that George Washington's father and half brother were iron ore miners and blast furnace operators in Colonial Virginia and Maryland and that George was the explorer who led later ironmakers into what is now West Virginia where the modern steel center of Wheeling was built.

Labor Utilization Discussed

Written from the standpoint of plant management, the Department of Labor, Bureau of Labor Statistics has published Bulletin No. 807, "Improvement of Labor-Utilization Procedures." Absenteeism of workers, labor turnover, wage structure, supervision of workers, plant organization and methods, working conditions and safety, and employe morale are among the subjects covered. Copies are available through the Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C., at 10 cents for single copies.

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Industry BRIEFS

INTERNATIONAL Harvester Co., Chicago, plans erection of a foundry, forge shop, machine shop, warehouse and central heating plant to be erected on the east bank of the Mississippi river, between Alton and Wood River, Ill., to cost $44,000,000 for the production of farm tractors. The new plant will occupy a 375-acre tract.

° ° °

North End Foundry Co., Milwaukee, has sold its land and buildings to its next door neighbor, the Le Roi Co., manufacturer of gas engines. The foundry's machinery and equipment is not included in the sale, which was made at $150,000. The Le Roi Co. will use the property for storage and additional factory space.

° ° °

The Flynn & Emerich Co., with foundry at Grantley avenue and the Western Maryland Railway, Baltimore, will start work at once on the erection of a one-story addition, 41 x 121 ft., to its foundry to be used for cleaning and shipping. Early this year the company built an addition to its coreroom.

° ° °

Westinghouse Electric Corp., Pittsburgh, has announced acquisition of the B. F. Sturtevant Co., Boston, which becomes a wholly-owned Westinghouse subsidiary, operating as the B. F. Sturtevant Co., a division of Westinghouse Electric.

° ° °

Superior Iron Works Co., Superior, Wis., has closed its foundry and disposed of all equipment. Re-establishment of operation of foundry operations is not contemplated.

° ° °

Schaible Foundry Co., Cincinnati, plans construction of a modern foundry on a site adjoining present holdings which has been acquired from American Compressed Steel Corp. The new structure will cover 20,000 sq ft of floor space.

° ° °

Winona Machine & Foundry Co., Winona, Minn., Robert Leicht, manager, plans a one-story foundry addition.

° ° °

American Steel Foundries, Alliance, O., plans construction of a plant addition and installation of a paint spraying system, to cost about $29,000.

° ° °

National Bearing Metals Division of American Brake Shoe Co., 2930 Manchester avenue, St. Louis, has bought a tract of 98,100 sq ft, adjoining the present American Brake Shoe Co. plant.

° ° °

Medina Iron & Brass Co., Medina, N. Y., closed for over a year, has been reopened. Frederick J. Weider, Rochester, N. Y., well known in the plumbing and heating trade, has been made president, and Thomas Boyd, superintendent and production manager of the company for the last 25 years, has been appointed secretary.

° ° °

Centrifugal Casting Co., 604 West Washington street, Bluffton, Ind., plans construction of a new foundry which will contain production squeezer floors and a completely new centrifugal casting operation, employing the use of three centrifugal machines. C. F. Sterling is president.

° ° °

Whipple & Choate Co., Bridgeport, Conn., has rebuilt its entire plant which was destroyed by fire a year ago. The building, nearing completion, is 100 by 200 ft, of steel and concrete construction and houses reverberatory furnaces of 50 tons capacity, each. The plant manufactures brass and bronze ingot metals.

° ° °

Building permit has been issued for repairs and improvements to the building of the Molding Supply Co., 1121 Meridian avenue, Alhambra, Calif., to cost $8000.

° ° °

Henderson Foundry & Machine Co., Hampton, Ga., branch of Southern States Equipment Corp., Birmingham, Ala., has been awarded the Army-Navy "E" flag for excellence in war production.

° ° °

Crown Iron Works Co., Minneapolis, has been awarded the Army-Navy "E" for the fourth time for excellence in war production. The company manufactured bridge parts for the Army Corps of Engineers.

° ° °

Acme Foundry Co., 3161 Hiawatha avenue, Minneapolis, has let contract for a one-story foundry addition.

° ° °

Georgia Foundry Co., Seattle, has been incorporated with $10,000 capital, by N. Seidelenbacher, 448 Ravenna boulevard, and associates.

° ° °

Independent Pneumatic Tool Co., Aurora, Ill., has been granted a fourth renewal of the Army-Navy "E" Award in recognition of continued production achievement in the manufacture of pneumatic and electric tools. The original award was presented in October, 1943.

° ° °

Superior Foundry Co., Cleveland, was awarded the Army-Navy "E" June 15. George J. Feiss, company president, and Sygmund Simon, an employee for 51 years, received the pennant from Maj. Ralph H. Coburn, Cleveland Ordnance District. Representing the employees in accepting the "E" pins from Lt. Com. J. P. Sturges were Sidney P. Schloss, Harold W. Wheeler, William T. Stevens, Walter Milicki, Joseph Migacs, and Charles Weatherspoon.

° ° °

Frederick Iron & Steel Co., Frederick, Md., manufacturer of centrifugal pumps, stokers, castings and other products, has been purchased by a syndicate of investors headed by Sidney G. Rose, Phillip L. Moskowitz and Meyer Goldberg. W. A. Riddle, who formerly headed the Frederick company, remains as general manager.

° ° °

Pomona Pump Works of Fairbanks, Morse & Co., Pomona, Calif., received the Distinguished Service Safety Award of the National Safety Council at plant ceremonies June 15. The plant's lost-time accidents were reduced from 107 in 1943 to 28 in 1944 and have been negligible so far in 1945.

° ° °

Foundry equipment sales in June represented 375.4 per cent of the 1937-38-39 monthly average, according to the Foundry Equipment Manufacturers Association. This compares with 404.7 in May and 466.1 in June, 1944.

° ° °

Terminal City Iron Works Ltd., Vancouver, B. C., Canada, suffered a $100,000 loss in a recent fire. The pattern shop was completely destroyed. This foundry, established 45 years ago, has carried on business at the same location for 35 years.

° ° °

Santa Monica Pattern Works, Santa Monica, Calif., is the firm name under which John Robert Hall and William H. Hall have published a certificate that they are conducting business at 22nd street and Virginia avenue, that city.

° ° °

Heberfelde Steel Co., Bakersfield, Calif., plans an addition to its foundry at 2200 "S" street, to cost $3500.

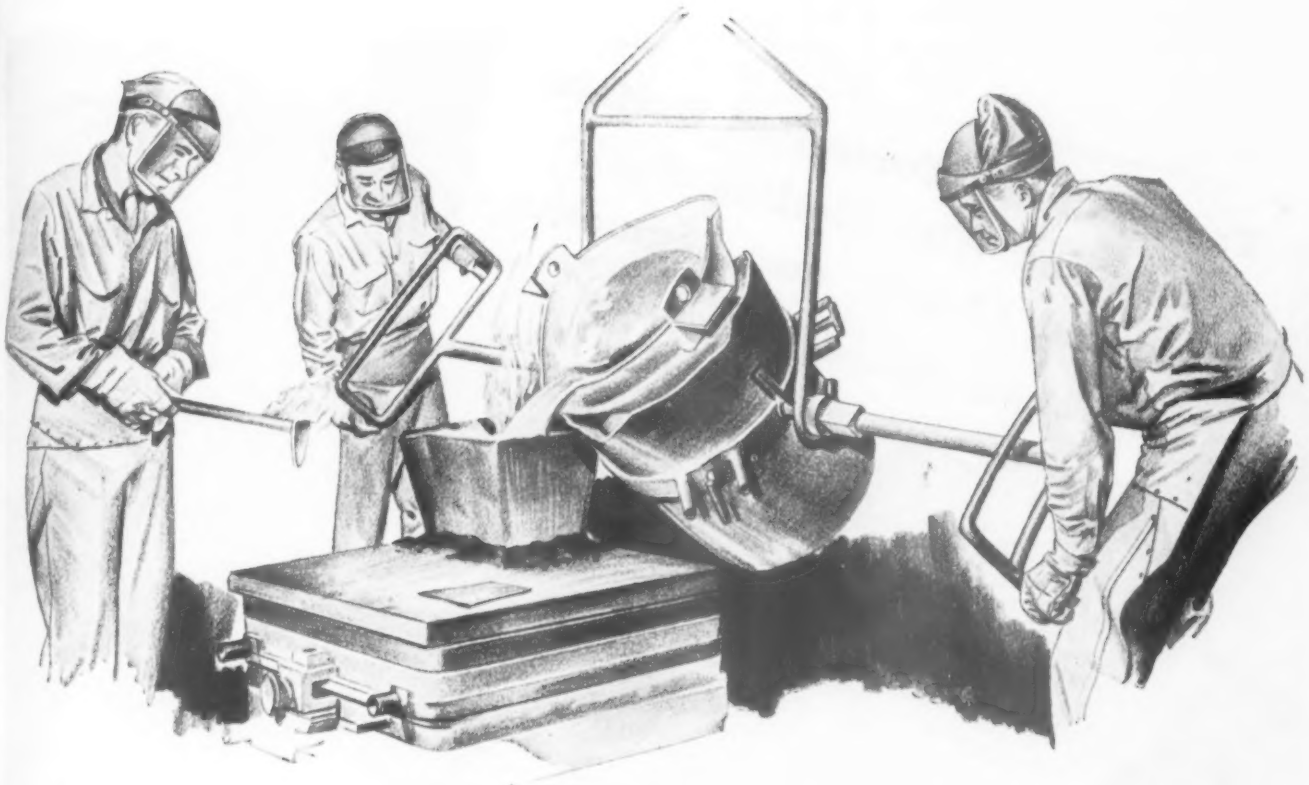
° ° °

Corporate name of the Mansfield Brass Foundry Inc., Mansfield, O., has been changed to Mansfield Brass & Aluminum Corp. No changes in management or policies are involved.

° ° °

Main offices of General Electric X-Ray Corp., Chicago, have been transferred from 2012 Jackson boulevard, to the Insurance Exchange building, 175 Jackson boulevard, that city. Additional

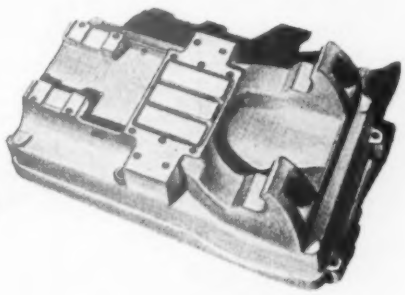
(*Concluded on page* 153)



Magnesium alloys produce sound, easily machinable castings

and Dow backs you up with

quality materials and unmatched experience



If you're searching for casting alloys that will give you high strength, shock resistance . . . *plus light weight and good machinability* . . . then turn to magnesium.

Magnesium alloys can cut your costs by their thrifty, high-speed machining . . . easy sawing . . . fast drilling and tapping.

So turn to magnesium . . . and turn to Dow for Dowmetal Magnesium Alloys. These *quality* materials, produced to meet a wide variety of property requirements, have been developed over the years for their strength, toughness, machinability, corrosion resistance, thermal conductivity and adaptability to fabrication processes.

Turn to Dow, too, for the services of its large staff of trained technicians constantly advancing magnesium research. Consultants are on hand at the nearest Dow office to help with your own shop problems.

MAGNESIUM

THE METAL OF MOTION

MAGNESIUM DIVISION, THE DOW CHEMICAL COMPANY, MIDLAND, MICHIGAN

New York • Boston • Philadelphia • Washington • Cleveland • Detroit • St. Louis • Chicago • Houston • San Francisco • Los Angeles • Seattle

Faster, Closer Controlled Surface Grinding With Sterling No. 2 Patented Chucks and Segments

One of the "Wheels of Industry"

Sterling's long-time experience guarantees better than usual grinding results.

Sterling's segments are not gap-type. There is no large, open space between the segments to catch and send small pieces flying off the table. Their patented, interlocking design means added strength throughout the entire abrasive ring. The minute space between segments provides cooler grinding. Sterling segments remain firmly in place after being fastened in the chuck. One setting lasts until the segment wears down. It is a matter of moments to insert the socket wrench, remove the worn units and replace them with new ones.

Sterling No. 2 Chucks and Segments are adaptable to a variety of machines using 8" to 20" diameter cylindrical wheels . . . they provide close grinding control not ordinarily obtained. May we tell you how they can reduce costs and increase efficiency for you? Write today!

Sterling No. 2 Chucks and Segments are fully outlined in the new Specification Selector . . . so are other "Wheels of Industry."

Ask for your free copy on your letterhead and it will be mailed at once.

• STERLING ABRASIVES •

THE STERLING GRINDING WHEEL DIVISION
OF THE CLEVELAND QUARRIES COMPANY
TIFFIN, OHIO

THE WHEELS OF INDUSTRY

(*Concluded from page* 150)

manufacturing facilities will be made available by the move.

• • •

Dockson Corp. has acquired the manufacturing rights of the Maluminum Co. Inc., Indianapolis, and has completed extensive facilities at its Detroit plant for the production of iron, brass, bronze and aluminum flux. H. W. Kramm, son of the founder of the Maluminum Co., is in charge of flux sales for the Dockson Corp.

• • •

Standard Pattern Shop is the firm name under which Kenneth L. Maynard and Paul E. Hansen have published a certificate that they are conducting business at 8714 South Main street, Los Angeles, Calif.

• • •

C. B. Hunt & Son Inc., Salem, O., producer of valves and couplings, has had a change of management and now is incorporated. N. A. Pedersen is president and N. C. Hunt is treasurer.

• • •

Eclipse-Pioneer Division of Bendix Aviation Corp., Teeterboro, N. J., has been awarded the Navy "E" for the third time, in recognition of outstanding aircraft production.

• • •

Schaible Foundry & Brass Works Co., Cincinnati, plans construction of an addition to its plant, a one-story structure, to contain 20,000 square feet of floor space.

Book Review

Chemistry for Electroplaters, by C. B. F. Young, cloth, 205 pages, 5¼ x 8½ inches, published by Chemical Publishing Co., Brooklyn, N. Y. Price $4.

In many instances electroplaters are practical men lacking the chemical background which would help them understand the reactions involved and solve problems in preparing solutions for good results. To aid those who are interested in overcoming that handicap the author has prepared this book, based on long experience in teaching chemistry to electroplaters. The book is divided into 12 chapters of which the first discusses chemistry and chemical change, and second hydrogen, diffusion and three states of matter. Chapters III, IV and V are concerned with carbon dioxide and monoxide, atmospheric elements, atoms and molecules, symbols, valence, chemical equations, chemical computations, chlorine, acids, bases and salts, inverse proportions, gas laws, sulphur and its compounds, temperature and pressure of gases.

Chapter VI discusses true solutions, suspensions, emulsions, colloidal solution and atomic weight; chapter VII, compounds of nitrogen, ions, electrons and ionization, and chapter VIII, ionic reactions, compounds of sodium and potassium. Chapter IX deals with the halogen family, the periodic law and the structure of the atom. Remaining chapters are concerned with phosphorus and alkaline earth groups, aluminum, silicon, iron, cobalt, nickel, zinc, cadmium, mercury, tin, lead, copper, silver, gold, platinum, rhodium, tungsten, chromium, molybdenum and vanadium.

Observes 50 Years In Business

Pitz Foundry Inc., Brooklyn, N. Y., is observing its 50th year in business. The company was founded as a pattern shop in 1895 by John Pitz, a patternmaker who had been born and educated in Germany in 1843 and came to the United States while still a youth. Later his son, John F. Pitz, took over the management. The latter established his own company in 1907 and three years later entered the foundry field with a partner to form the Pitz & Weber Iron Foundry. Nine years later, he purchased the interest of his partner and incorporated as Pitz Foundry Inc. His son, Robert G. Pitz, who now heads the company, joined the firm in 1923, and both shared in the management until the death of John F. Pitz in 1943. Associate companies of Pitz Foundry are the Loyal Textile Machinery Co. and Ames Hydrovac Inc., both of Brooklyn.

Quad City Chapter Plans Conference

The Quad City Chapter of the AFA will hold a two-day conference Nov. 15-16 at the Blackhawk Hotel, Davenport, Iowa. The general theme of the program will concern "Current and Post War Problems That Confront Foundrymen." A more detailed program will be announced later.

Opens Light Metals Display

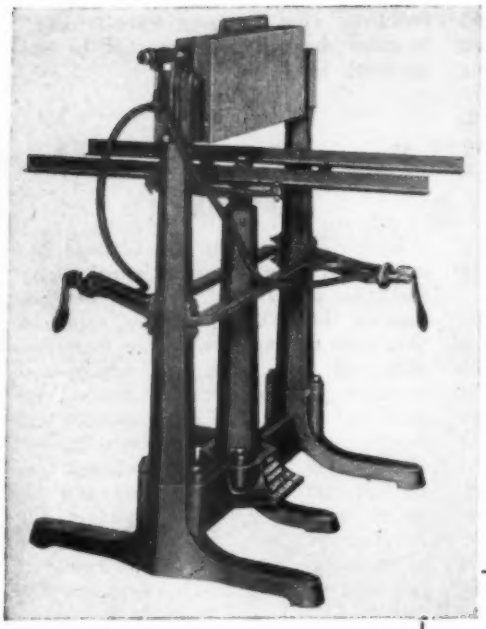
Edw. S. Christiansen Co., Chicago, has established a showroom, technical library and office at 831 South Flower street, Los Angeles 14. There will be exhibited aluminum and magnesium raw materials, semi and fully fabricated castings and wrought parts as well as finished assemblies representing the products and developments of the country's leading aluminum and magnesium producers, fabricators, foundries, consumers and research organizations. The displays will be changed regularly to show the trend of conversion from strictly war manufacture and use to civilian applications. The technical library will cover the technology of the light metals, their fabrication and use as well as the literature of the various manufacturers.

Appoints Southern Distributors

Ampco Metal Inc., Milwaukee, has appointed the following distributors to handle the sale of coated aluminum bronze weldrod in the states of Florida, Alabama, Mississippi, Tennessee, Kentucky, Arkansas and Louisiana: Cameron & Barkley Co., Charleston, S. C.; Mobile Welding Supply Co., Mobile, Ala.; Delta Oxygen Co., Memphis, Tenn., and Louisiana Welding Supply Co., Baton Rouge, La.

CAR WHEELS FOR RUSSIA: Pouring cast iron wheels at a Nova Scotia foundry. Under the Mutual Aid agreement, three Canadian companies are building railroad cars for Russia under the supervision of Soviet technicians

FEDERALS



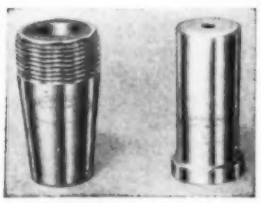
THE VIBRA-DRAW CORE DRAWING MACHINE

The ideal machine for drawing more cores and better cores than you've ever had before. The separate center stand which supports the core tray is not affected by vibration of the drawing head. Core makers draw successive cores on same core tray without shaking down cores already drawn.

The VIBRA-DRAW drawing head has 100 accurately machined grooves on each side—accommodates two core makers and ensures an accurate lift for the entire height of the draw. Our new circular tells all about it—why not write for it today?

WATER BRUSH

Easy to Grip and Hard to Tip. It can't leak and one filling lasts all day. Does not tire the molder's hand.



TUNGSTEN-CARBIDE BLAST NOZZLES

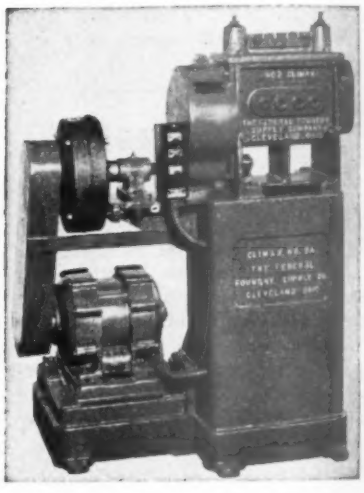
Cut Cleanings Costs! Reduce Your Air Costs! Cut Shut-down Time! Clean Faster and Better! You can do all these things simply by installing Federal Blast Nozzles in your cleaning equipment. Buy and install one—prove it in your own plant.

TWISTED STEM CHAPLETS

The chaplet with everything. The "Twisted Stem" promotes rapid complete fusion. Not deformed, the stem has no weak spot to burn in and permit core shift. Made in a complete range of sizes. Samples of the size you use, gladly submitted.

CLIMAX WIRE STRAIGHTENERS

Any foundry, large or small, can cut production costs by straightening and re-using core wires and rods. With a Climax Wire Straightener this can be done quickly, economically, safely—by unskilled labor. A complete descriptive circular is yours for the asking.



All Federal Productsre

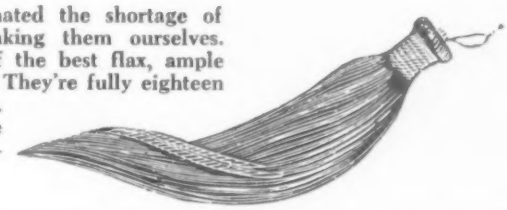
THE FEDERAL FOUNDRYSU

Seacoal Plant
CROWN HILL, W. VA. · CHICAGO · MILWAUKEE · DETROIT · ST. LOUIS HATT

Chamberlain Co., Los Angeles, Calif. · Pacific Graphite Works, Oakland, Calif. · LaGrand Industrial Supply Co., Portland, Ore ument

L SUPPLIES

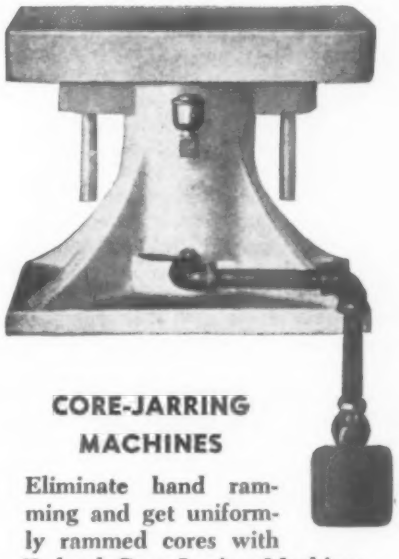
SWABS—We have eliminated the shortage of this essential item by making them ourselves. Federal swabs are made of the best flax, ample in size and won't fall apart. They're fully eighteen inches long and full-bodied. Shipped from stock — the supply is ample. Jobber inquiries are invited.



RUBBER-COVERED SHOVEL HANDLES

The best insurance you can buy against damaged patterns, core boxes or flasks. The pear-shaped grip is ideal for ramming.

They will fit your present shovels or you can order your next shovels with them already installed.



CORE-JARRING MACHINES

Eliminate hand ramming and get uniformly rammed cores with Federal Core Jarring Machines. Powered by air, these machines are sturdy and long wearing. Readily available now when you need them. The present lack of experienced labor will not handicap your shop if you have Federal Core Jarring Machines.

THE LOWE ELECTRIC SIFTER

Faster sifting, better sand conditioning combine to cut costs when a Lowe is on the job. Malleable yoke creates faster sifting; more shovel clearance permits faster loading. Enclosed ball bearing motor is a miser on current. Instantly replaceable screen bottoms. Lowe-sifted sand is better sand. The Lowe's 21-inch diameter screen bottom gives you over 10% more screening surface than the conventional 20-inch screen!

WONDER CUTTER

Users say it's worth its weight in gold. Small enough to be mounted on any bench or table, the Wonder Cutter will cut round or square rods and band iron. Priced at $39.50 f. o. b. Cleveland — every foundry should own one.

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...RY SUPPLY COMPANY · 4600 EAST 71st STREET CLEVELAND 5, OHIO

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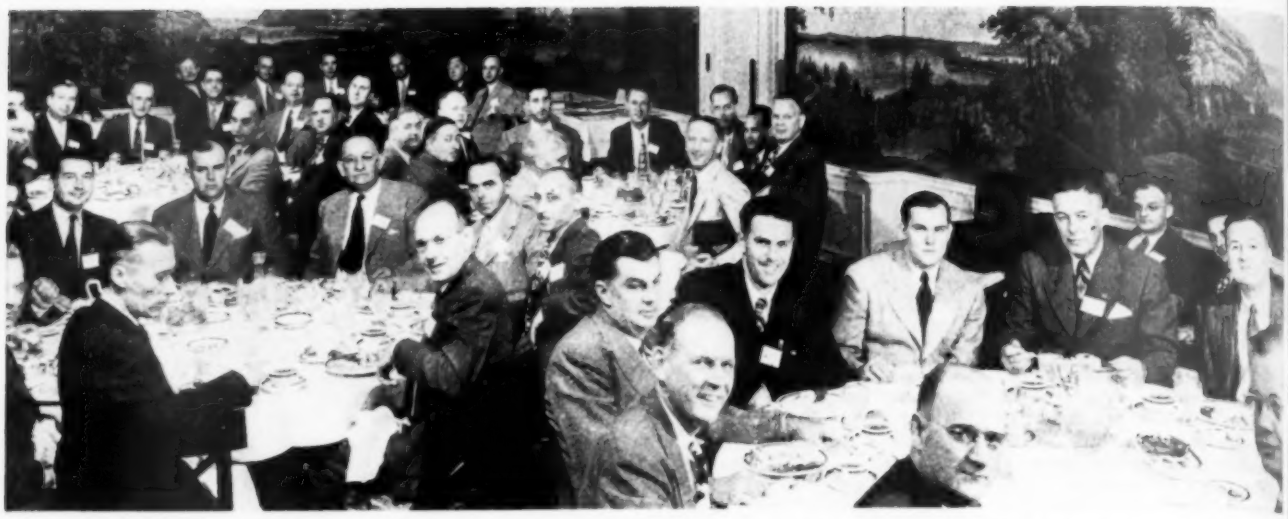
...and. Dixiemont Cement Sales Company, Houston and Beaumont, Texas and Harvey, La. · Shanahan's Ltd., Vancouver, B. C.



CHAPTER CHAIRMEN: Leaders of the various AFA chapters shown at a luncheon meeting and (below) at their annual conference held prior to the recent AFA business meeting in Chicago

AFA ANNUAL MEETING

(*Continued from page* 93)

In addition to the chapter chairman and association directors present, the annual business meeting dinner drew a large attendance from the membership of the Chicago Chapter of AFA. Ralph J. Teetor, Cadillac Malleable Iron Co., Mich., and retiring president of the AFA, presided at the dinner. In opening the meeting, he introduced the national officers and the chapter officers present. He then read the following cablegram from J. W. Gardom, president, and Tom Makemson, secretary, of the Institute of British Foundrymen:

"The president, council and members of British Foundrymen at the annual meeting in London send cordial greetings and good wishes to all members of the American Foundrymen's Association and look forward to an early meeting."

In the annual report of the president, Mr. Teetor welcomed the chapter chairmen and paid tribute to the excellent work which has been done by the chapters during the past year. He also thanked the members of the Chicago Chapter for the splendid attendance at the annual meeting. Mr. Teetor reported on the cancellation of the 49th annual convention, which he explained was a war casualty, and outlined the emergency program which was undertaken in lieu of that convention. He dealt at some length with the accomplishments of the AFA during the past year, pointed out that the membership had increased to approximately 8000, the highest point in the history of the association, and paid tribute to Fred J. Walls and the membership committee for their work.

The president reported that by action of the board of directors, the annual dues for companies had been increased from $25 to $50, and that the minimum dues for sustaining members had been increased from $50 to $100, effective July 1, 1945. He stressed the point that no changes had been made in dues for personal or affiliate members. Mr. Teetor then reported that during the year, chapters had been organized in central Ohio, Oregon, Saginaw, Mich., and Erie, Pa. Credit for the growth of the chapter movement was attributed by the president to Bob Kennedy, to the various local committees who undertook the job of organization, and to the neighboring chapters who assisted in many ways.

During the year, the association acquired the extensive technical library of the late Dr. Richard Moldenke. President Teetor pointed out that this constitutes a notable addition to the AFA library, which now is perhaps the largest on foundry data in the United States.

The history of the technical development program starting with the foundation, was discussed at some length, by President Teetor. He stated that much

(*Continued on page* 158)

IT'S NOT CHILD'S PLAY

Team up with MOGUL and KORDEK — you can depend on them.

KORDEK

KODEK is a perfect DRY BOND which can be used in smaller quantities than most dry binders. KORDEK produces better castings with fewer discards.

TURNING out money-making castings is not child's play. It's man's work . . . and it takes skill and experience and "know-how".

Most foundry men use and value MOGUL and KORDEK because they have fewer discards, hence more profitable production.

MOGUL is a perfect Green Bond, which increases permeability in cores. Use MOGUL in cores for both green and dry strength.

MOGUL works with core oil; it decreases drying time and yields smooth cores. MOGUL works perfectly with pitch or resin, too, because cores can be handled while still warm. MOGUL is widely used with sharp sands.

CORN PRODUCTS SALES CO. 17 BATTERY PLACE NEW YORK 4, N. Y.

(*Continued from page* 156)

has been accomplished by the organization during the first year under the leadership of Norman Hindle. The program has included the publication and revision of books, a number of general interest and special interest investigations, the library service, and work on casting education, both within and without the foundry industry. The president explained that plans are underway for expansion of the personnel of the technical development program. The president also reported that the association had co-operated fully during the past year with the various trade associations which serve the foundry industry. He paid tribute to the work of these associations and suggested the need for greater unity among the various branches of the industry. In closing, he paid tribute to the work of the splendid staff of the AFA offices in Chicago.

L. C. Wilson, Reading Steel Casting Division of American Chain & Cable Co., Reading, Pa., and chairman of the board of awards of the association, announced his regret that Rear Admiral A. H. Van Keuren, USN was unable to be present to receive the award of honorary life membership in the A. F. A. in recognition of his effort in behalf of the foundry industry. Admiral Van Keuren will receive this award during the fall at a meeting of the Chesapeake Chapter of the AFA.

Mr. Wilson then presented an honorary life membership in the AFA to M. J. Gregory, a past director of the association, for his contribution to the association and the foundry industry. In responding, Mr. Gregory paid high tribute to the assistance given him over a period of many years by his friends "who call themselves peddlers, but who are really sales engineers."

Robert E. Kennedy, secretary of the association, reported on results of the 1945 national apprentice contest. Mr. Kennedy traced some of the history of these contests, which started in 1925 with the first apprentice molding contest. He paid tribute to the men who have aided in the contest work and mentioned especially the boys who have been aided by M. J. Gregory in connection with foundry apprenticeship. Secretary Kennedy indicated special pleasure in finding that one of the prizes was won by Robert Cech, Cleveland Trade School, and the son of Frank Cech, instructor in patternmaking at that school and chairman of the Patternmaking Committee of the AFA. Results of the contest, which was judged by a committee of the Chicago Chapter of the A.F.A., were as follows:

Nonferrous Molding

1. John Hronek, Wisconsin Aluminum Foundry Co., Manitowoc, Wis.
2. Frank Spano, Allis-Chalmers Mfg. Co., Milwaukee.
3. John Chrnelich, Allis-Chalmers Mfg. Co., Milwaukee.

Gray Iron Molding

1. E. Doucet, Canadian National Railways, Montreal, Que.
2. Steve Grabowski, Cleveland Trade School, Cleveland.
3. H. Lalonde, Montreal Foundry Ltd., Montreal, Que.

Steel Molding

1. Frederick C. Krueger, Birdsboro Steel Foundry & Machine Co., Birdsboro, Pa.
2. P. Crevier, Canadian Car & Foundry Co., Montreal, Que

Patternmaking

1. Anthony Taddeo, Birdsboro Steel Foundry & Machine Co., Birdsboro, Pa.
2. Robert Cech, Cleveland Trade School, Cleveland.
3. D. MacKenzie, Canadian National Railways, Montreal, Que.

The John A. Penton gold medal of the AFA then was presented to Clarence Edgar Sims, supervising metallurgist, Battelle Memorial Institute, Columbus, O., for his outstanding contribution to the steel casting industry, the presentation being made by Mr. Wilson. In responding, Mr. Sims indicated that any contribution which he may have made to the industry was possible only because men who believe that research will pay had provided opportunities and facilities for the work that has been done.

Because Dr. Harry A. Schwartz manager of research, National Malleable & Steel Castings Co., Cleveland, was unable to be present to present his foundation lecture on "Solidification of Metals," an excellent abstract of this splendid paper was presented by Fred G. Seping, International Nickel Co., New York. A digest of the lecture, as prepared by Dr. Schwartz, is presented on page 107.

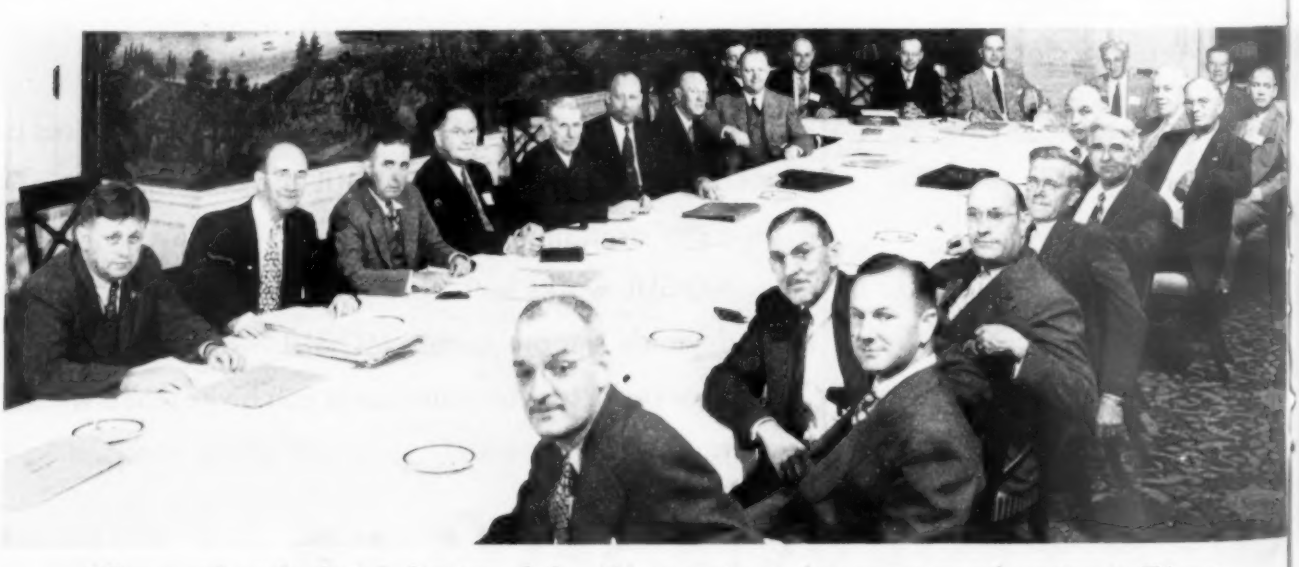
The Joseph S. Seaman Gold Medal of the AFA was presented to Robert Edwin Kennedy, secretary of the association, for his outstanding meritorious service to all branches of the foundry industry through his work in organizing and guiding the development of technical and operating papers and discussions, and his untiring encouragement to all AFA chapters, committees and members. The presentation was made by Herbert S. Simpson, National Engineering Co., Chicago, and a past president of the association. In making the presentation, Mr. Simpson paid high tribute to the many contributions of Secretary Kennedy, dating back to his first AFA convention in Detroit in 1910. In accepting the medal, Bob Kennedy expressed the thought that the accomplishments which had been outlined had been made possible only through the work of others, including various technical committees, the staff at the national office, and the members of the association.

Secretary Kennedy reported on the election of officers which resulted as follows:

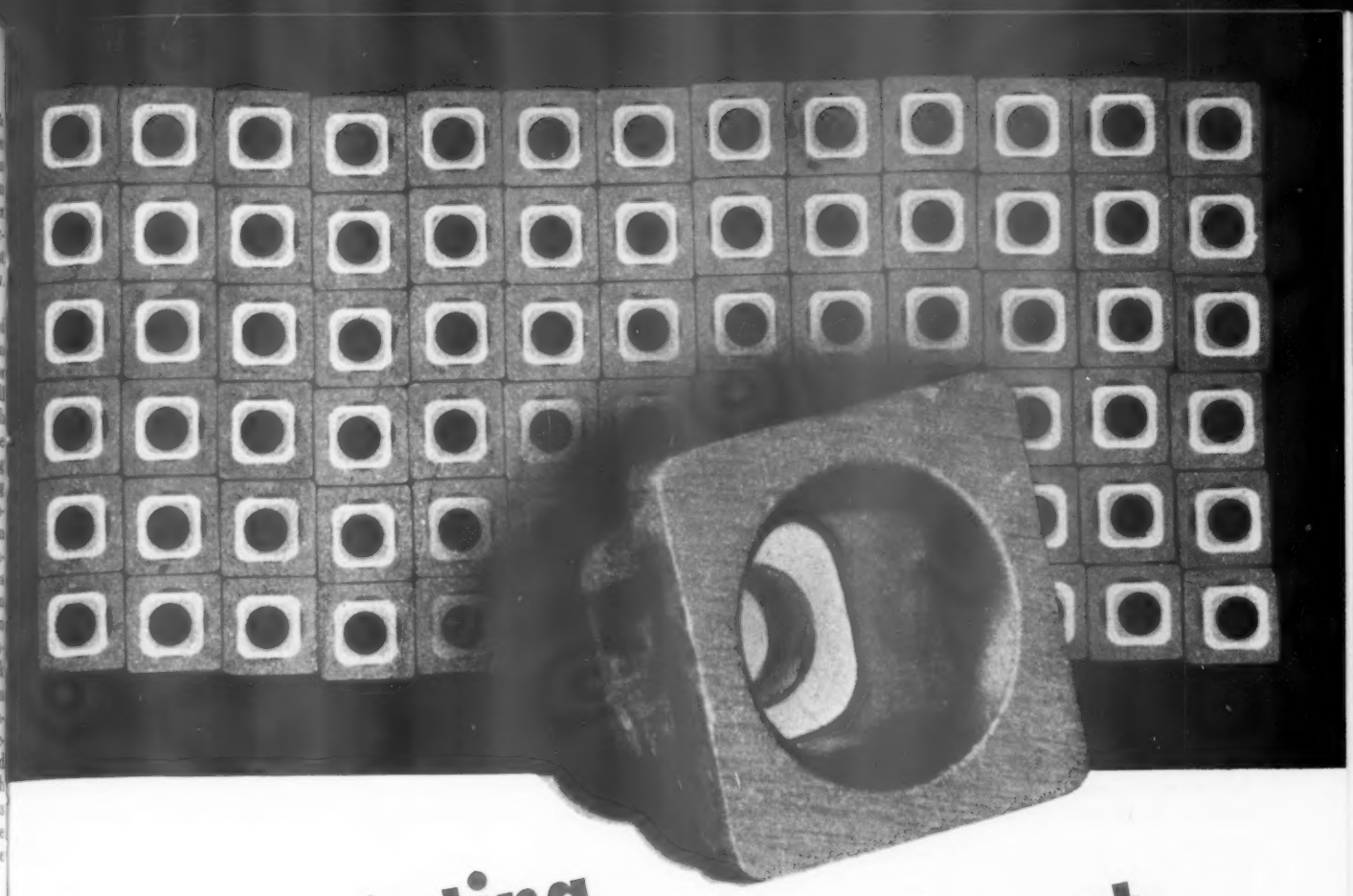
President, Fred J. Walls, International Nickel Co., Detroit; vice president, Sheldon V. Wood, Minneapolis Electric Steel Castings Co., Minneapolis; directors for three years, George K. Dreher, Ampco Metal, Inc., Milwaukee, Edwin W. Horlebein, Gibson & Kirk Co., Baltimore, Harold H. Judson, Goulds Pumps Inc., Seneca Falls, N. Y., James H. Smith, General Motors Corp., Detroit, Frederick M. Wittlinger, Texas Electric Steel Casting Co., Houston, Tex.; director for one year, Ralph J. Teetor, Cadillac Malleable Iron Co., Cadillac, Mich.

The concluding speaker of the meeting, Max Kuniansky, vice president and

(*Concluded on page* 160)



Officers and newly-elected directors of the AFA in session at their recent annual meeting in Chicago



This casting had a checkered past

With rejections 40% RADIOGRAPHY helps cut them to less than 5% ... saves unnecessary machining

The checkerboard pattern you see is a radiograph of a group of aluminum motor shaft housings, revealing their hidden flaws. But you'll want to read the full story . . .

TROUBLESOME FROM THE VERY START, the order called for cast aluminum housings with a three-piece metal insert. Troublesome? Any foundryman knows the headaches of locating inserts to a "T" . . . of getting a sound bond between insert and casting metal . . .

Satisfactory motor performance demanded precision . . . so a seemingly correct casting technic was developed. Castings were delivered to the customer. Radiographic inspection turned thumbs down on 40%. Many inserts were out of place, and incomplete bond was common.

Radiography had forestalled the wasteful machining of many faulty parts—and from the customer's viewpoint, the savings were important and obvious. *But radiography went a great step further . . .*

To reduce rejections, the foundry tried new casting technics . . . each step was radiographed, studied, and changed. Thus, with the help of X-ray, a satisfactory procedure was finally achieved, and deliveries of the improved castings began. Continuing radiographic inspection showed that rejections were now *less than 5%!*

* * *

This case history repeats common experience. For radiography is *more* than an inspector of internal structures . . . it's a design tool, too. X-rays show designers how to reduce weight safely. They help engineers specify sound processing technics. They guide the fabricators to better fabricating methods.

Now is the right time to explore *full* use of radiography in your plant. See your local X-ray equipment dealer.

EASTMAN KODAK COMPANY
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RADIOGRAPHY

ANALYZES . . . INSTRUCTS . . . CORRECTS . . . IMPROVES

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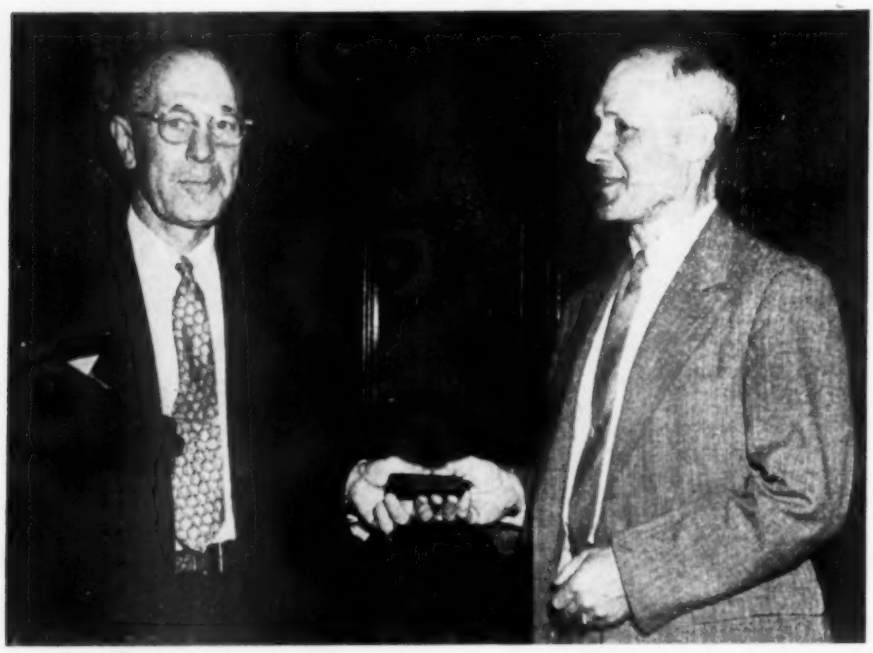


C. E. Sims, Battelle Memorial Institute, receives the John A. Penton Gold Medal from L. C. Wilson, chairman of the AFA board of awards. Shown below, left to right, are: R. E. Kennedy, H. S. Simpson, G. K. Dreher, M. J. Gregory and F. J. Walls. (Photos courtesy John Bing, A. P. Green Fire Brick Co., Milwaukee)

(*Concluded from page* 158)

general manager, Lynchburg Foundry Co., Lynchburg, Va., declared that during the stress of war, men of the industry have learned to co-operate with one another, and to make a better and more uniform product. The war has brought many developments in equipment, in products, and in practice. The industry has seen the engineering profession accept gray iron in quantities as never before. Gray iron is being made with greater tensile strength, greater properties for high temperatures, greater corrosion resistance, etc. The industry has learned to make good iron.

But what of the future? Mr. Kuniansky believes that the industry must recognize that it will be necessary for it to do a great job of education. If the industry is to grow and take advantage of the technical advances, foundrymen must educate the public, the schools, the colleges, etc., that the foundry industry is not a place where we make things in dirt. If foundries are to attract proper men upon which can be built a good, sound industry, these workers must be educated upon the advantages and opportunities offered by foundries.

Mr. Kuniansky emphasized that the industry is to blame for the prevailing ideas of what constitutes a foundry, because the men of industry have not presented the facts regarding what the industry does in serving the American civilization. No industry is built solely by machines, he emphasized, but is built of men.

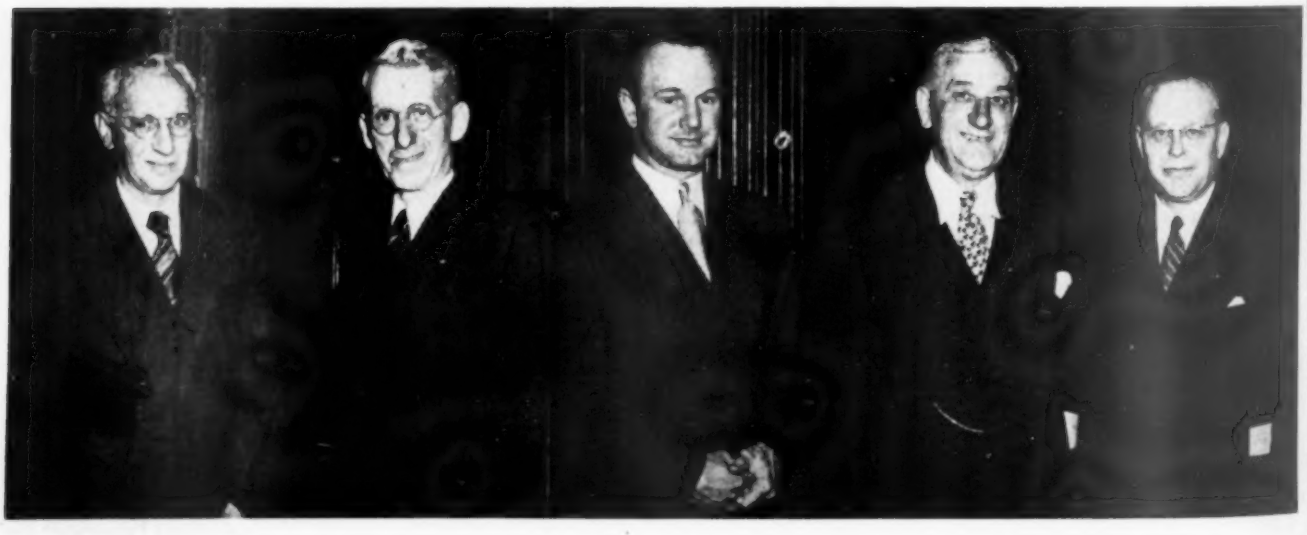
The conference of AFA chapter chairmen had representation from all but one chapter. Many problems dealing with the co-ordination of national and local activities were discussed during the meeting, and stress was laid upon the background of accomplishment and the committee work of the AFA. S. V. Wood, Minneapolis Electric Steel Casting Co., Minneapolis, and the chairman of the Chapter Contacts Committee of the board of directors, presided at the two-day session.

At the luncheon on the last day of the conference, Charles Hoehn, Jr., Enterprise Engine & Foundry Co., San Francisco, and president of the Northern California Chapter, presented a cordial and earnest invitation to the AFA to conduct its 1947 convention and exhibit in San Francisco. The invitation was extended on behalf of the Northern California Chapter of the AFA, the San Francisco Convention & Tourist Bureau, the San Francisco Chamber of Commerce, the California Northern Hotel Association and the Office of the Mayor of San Francisco.

Wisconsin Chapter Holds Golf Party

The Wisconsin Chapter of the AFA held its annual golf and stag meeting at the new Ozaukee Country Club, Milwaukee, July 20 with an attendance of 700 members and friends taking advantage of the golf, cards, etc. provided by way of entertainment. In spite of cloudy weather and at various times a slight drizzle, a good time was enjoyed by all. There were many prizes for golfers and a good number of door prizes, which consisted of 45 books of war stamps. A fine buffet dinner was served at 6 p.m. and immediately afterwards the prizes were awarded by Chapter President John Bing, and the chairman of the golf party, Clarence Gehrman. A well planned floor show climaxed a very fine and enjoyable day.—*Walter Gerlinger, publicity chairman.*

Miller Mfg. Co., Detroit, has acquired Monroe Steel Castings Co., Monroe, Mich. The sale involves no changes in management or personnel.



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MODERN
CLEANING ROOM IS
MID-WEST
EQUIPPED

● Products of the Mid-West Abrasive Company go a long way toward solving the problems of your cleaning room.

Mid-West snagging wheels, cut-off wheels, cones and other foundry type abrasives are designed by engineers familiar with the production demands of the foundry. They last longer, cut faster and cooler.

And when you inquire about Mid-West foundry type abrasives, ask our representative to demonstrate the Mid-West wheel dresser and cutter.

Performance alone is the yardstick used in measuring Mid-West values. Apply that yardstick today!

MID-WEST ABRASIVE CO.

Manufacturers of DEPENDABLE Abrasives

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40 years of valuable experience can mean the difference between success and failure when it comes to solving the intricate problems of Industrial Dust Control.

Pangborn Corporation has that 40 years of valuable experience and offers its benefits to you for application to *your* problems,—no matter how large or small.

The two installations pictured above show the flexibility of our Dust Control program. The large one is a giant "CH" Collector, doing an efficient, economical job and occupying a minimum of space. In the insert is our new "CK" Unit Collector which was specifically designed to handle small air volume dust requirements of industrial operations. Into both of these collectors have gone the research and knowledge of our 40 years experience.

During these hard-hitting, war production times, the value of Dust Control has been forcibly brought home to a great many alert industrialists. They are thinking in terms of tomorrow as well as today and realize the position of responsibility which Dust Control will occupy on the mammoth production lines of the future.

Come to Pangborn with your dust problems, for today or tomorrow, and receive—as an extra dividend—the benefit of our *40 Years of Valuable Experience.*

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WORLD'S LARGEST MANUFACTURER OF DUST COLLECTING AND BLAST CLEANING EQUIPMENT

PANGBORN CORPORATION · HAGERSTOWN, MD.

CASTING BRONZE AND ALUMINUM

(*Continued from page* 111)

or utensil must be thoroughly coated with this or some other mixture which will serve the purpose. These coatings should be applied at least once a shift and more often, if necessary and if possible.

In our aluminum foundries, we are slowly but surely changing over to the refractory or graphite type crucible and it is reasonable to expect that our troubles with iron pick-up in the aluminum alloys will be minimized or eliminated.

After thorough fluxing of the molten aluminum, the actual pouring process must be considered. All of the minute care and precautions used in melting metal can be nullified by improper and careless pouring methods. The pots must be skimmed of flux and dross very carefully and then the metal should be poured as fast as possible in order to prevent gas pick-up and loss of temperature. Hand pouring ladles should be preheated as close to pouring temperature as possible either in a ladle heater or by carefully submerging in the molten metal. Furthermore, every ladle of metal should be checked at pouring stations for different pouring temperatures necessary on different jobs. The metal pouring temperature should always be reached by allowing the temperature to fall to the desired temperature in the hand ladle and then pour immediately.

Avoid Metal Disturbance

Wherever possible, we prefer to pour metal by dipping a ladle in a stationary crucible or pot because there is less agitation. On large jobs, it is necessary to use tilting furnaces, large ladles and shanks but the hot metal should be treated as gently as possible holding the ladle against the lip of the melting furnace and allowing the metal to flow with minimum disturbance. Don't forget the small but necessary rule about pouring with the lip of the ladle as close to the sprue of the mold as possible and keeping the sprue filled at all times, thus preventing air from entering mold with hot metal which causes oxidation.

Every foundryman has a pet formula for gates and risers and I presume most foundrymen can be considered experts on some particular type of gate and riser. In the final analysis, the best gate and riser to use in making a casting is the one that is the simplest and gives the best results. It is possible for two foundrymen to gate the same job independently and both arrive at the same result—a good casting. In this case, the only thing to consider is the efficiency and comparative cost of the two gates.

The characteristic lightness of the light metal alloys more or less dictated the use of these alloys in aircraft. This caused considerable investigation of the

(*Continued on page* 164)

Quality...

THAT'S WHAT WE MAKE

A long time ago — when we started smelting — we had to make a decision. The question was . . . should we strive for volume production or a more limited quality production? Well, we made our decision . . . and have made quality alloys ever since. We've done very well, too, in building up our volume . . . and it is increasing every day.

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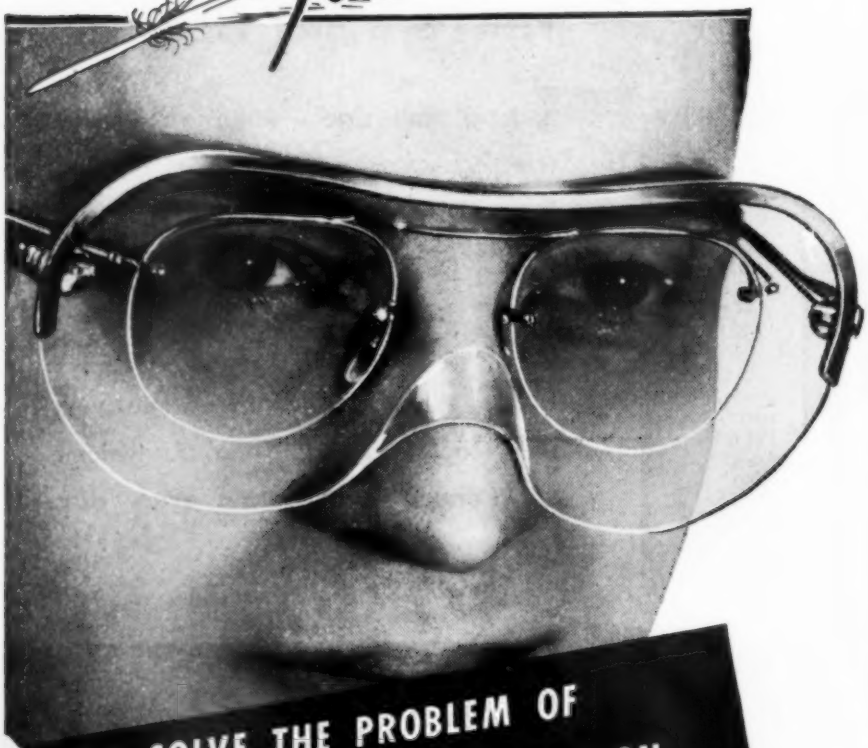
1720 ELSTON AVENUE CHICAGO 22, ILLINOIS

BRASS · BRONZE · ALUMINUM · LEAD · TIN · SOLDER · TYPE METALS · BABBITT · ZINC BASE ALLOYS

THE NEW WILLSON

FeatherSpec*



TO SOLVE THE PROBLEM OF KEEPING SAFETY SPECTACLES ON WORKERS IN SEMI-HAZARDOUS JOBS

• FeatherSpec makes real safety news; weighs less than an ounce; much lighter than other types. Large one-piece plastic lens; can be replaced in ten seconds; held firmly in "suspension-lock" frame; in clear or Willson *Tru-Hue*★ green. FeatherSpec means real economy; costs less; can be worn over regular glasses; saves cost of special prescription spectacles. FeatherSpec is convenient to carry; slips into shirt pockets. FeatherSpec provides new convenience; new comfort; so workers will wear it all day long; for light grinding, spot welding, woodworking and so forth.

See Your Willson Distributor
Or Write To F-7.

GOGGLES • RESPIRATORS • GAS MASKS • HELMETS

DOUBLE WILLSON PRODUCTS INCORPORATED
READING, PA., U. S. A. Established 1870

*Patent Applied For
★T. M. Reg. U. S. Pat. Off.

(*Continued from page* 162)

internal soundness of light metal castings and such investigations in turn influenced the nonferrous foundryman to revise and improve some of his conceptions of proper gating and risering of castings.

Earlier I mentioned that the characteristics of the alloy affect foundry procedures and bring out the problems to be solved by the foundrymen. When we are devising a gating set-up for a new bronze job, for example, we know instinctively that the following fundamentals must be considered:

1. Because we are dealing with a heavy metal at high temperature, it is unnecessary to have a large sprue. Due to its high specific gravity, we get the proper flow time in pouring with a comparatively small sprue.

2. Again because we are using a heavy metal, we must control the pressure, keeping our sprue filled and allowing the proper volume of metal to flow through to progressively larger runners and gates which will adequately handle the metal in a smooth and easy manner.

3. Because of the high metal temperature, we must be careful not to allow a large amount of metal to pass through one section of the mold cavity thereby overheating and destroying the green strength of the molding sand at that point, which would cause sand to be washed into the mold, burning in or scabbing. It is most practical to gate a casting as uniformly as possible so as to have metal enter into mold at equal uniform temperatures which in turn gives as uniform cooling as possible. I only mention these things as examples of the proper approach to problems in our everyday work. It is a good idea to find a reason for everything done in the foundry business and by doing so, you may not always be right, but you will find it easier to correct foundry faults.

Characteristic troubles resulting from gating, risering and chilling bronze castings follow:

1. Sand Holes and Dirty Castings—Caused by improper foundry technique regarding sprues, gates and runner, sand of low green strength and low permeability.

2. Shrinkage—Caused by improper or inadequate risering or chilling, not topping off risers with hot metal and lack of progressive feeding arrangements in runners and gates.

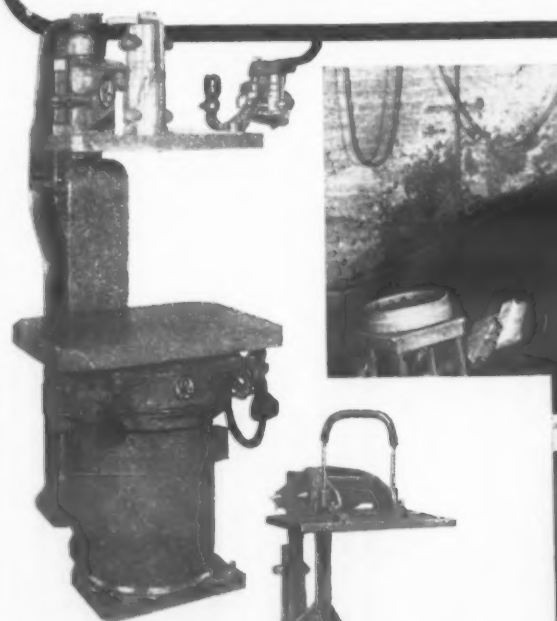
3. Blows—Caused by hard mold ramming, low permeability, improper venting of molds and cores, improperly baked cores, high moisture content in molding sand and cold or dirty chills.

In general we feel that a good gating ratio for bronze castings is ½ to 1 to 2. For most bronze castings, a sprue size from ½ in. diameter up to 1 in. diameter is large enough to pour almost any casting designed, depending upon melting capacity.

Avoid squirting of metal in the mold at all times. Maintain a good choke in the sprue either by using strainer cores

(*Continued on page* 166)

For SPEED THROUGH SIMPLICITY—the SPO No. 100 SERIES



These air-operated jolt-squeeze machines are ideal for work involving matchplates and gated patterns. The few moving parts are shielded from sand and grit. An open-end squeeze head permits using extra long flasks. Cantilever or post type squeeze heads; stationary or portable models; range of sizes. Bulletins upon request.

SPO

INCORPORATED

Manufacturers and Specialists in Molding Machines, Vibrators and Patterns for Production

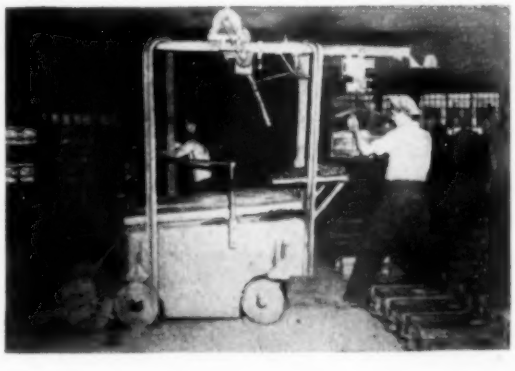
7500 GRAND DIVISION AVENUE • • CLEVELAND 5, OHIO

MEMBER

FOUNDRY EQUIPMENT MANUFACTURERS' ASSOCIATION, INC.

No labor...No lifting

Yet flasks are desanded quicker...safer...by smaller men



Finding men husky enough to handle flasks on squeezer and bench-molding floors is a problem no longer. You don't need those husky men.

Since Robins introduced the Floatex Shakeout equipped with the Automatic Flask Loader, anyone can handle the job. Old men, thin men, teen-age boys—all can do the shakeout work on flasks weighing as much as 300 pounds.

There is no labor, no lifting . . . the Automatic Flask Loader picks the flask from the floor and delivers it to the loading table of the Floatex Shakeout, which completely desands the flask and discharges the castings—all automatically . . . all in a matter of seconds!

In one foundry, stop-watch timing showed that nine round trips—9 flasks emptied and stacked, bottom boards removed and piled—are being completed in exactly 70 seconds! The loaded flasks weigh 150 lbs.; the men are 17 and 66 years old respectively; neither of them weighs over 135 lbs. Castings are cleaner; more sand is being removed from them and recovered for re-use.

If you are having trouble finding suitable help; if you are interested in greater production; if you would like more effective, more efficient, more economical shakeout work, ask Robins for facts about the Floatex Shakeout with the Automatic Flask Loader. When writing, please address Dept. F-9.

Robins Floatex Shakeouts are made in Portable models for loaded flasks weighing up to 17 tons; in Standard models, up to 100 tons or more—non-discharging and self-discharging types; with and without flask loaders.

ROBINS *makes:* BELT CONVEYORS • COAL AND ORE BRIDGES • BUCKET ELEVATORS • CAR AND BARGE HAULS • CAR DUMPERS • CAR RETARDERS • CASTINGS • CHUTES • CONVEYOR IDLERS AND PULLEYS • CRUSHERS • FEEDERS • FOUNDRY SHAKEOUTS • GATES • GEARS • GRAB BUCKETS • PIVOTED BUCKET CONVEYORS • VIBRATING SCREENS • SCREEN CLOTH • SELF-UNLOADING BOAT MECHANISMS • SKIP HOISTS • STORAGE AND RECLAIMING MACHINES AND SYSTEMS • TAKEUPS • LOADING AND UNLOADING TOWERS • TRIPPERS • WEIGH LARRIES • WINCHES • WINDLASSES

FOR MATERIAL AID IN MATERIALS HANDLING . . . . . *It's* **ROBINS**

ENGINEERS • MANUFACTURERS • ERECTORS

ROBINS CONVEYORS INCORPORATED
Founded in 1886 as Robins Conveying Belt Co.
PASSAIC • NEW JERSEY

MATERIALS HANDLING MACHINERY

(*Continued from page* 164)

or reducing the diameter at the bottom of the sprue in conjunction with the basin at the bottom. We favor the use of pouring cups or basins in conjunction with a round shaped sprue for bronze molding. Bottom gating is used wherever possible in bronze but always with the thought in mind that the progressive feeding necessary in all types of castings will decide the position of the gates and risers.

Sometimes by elevating one end of a mold for a casting with more or less uniform wall thicknesses, it is possible to facilitate directional flow and solidification in the casting, thus reducing the amount of risering necessary. A fault which may occur in bottom gating, top gating or any other type of gating is the concentration of high temperature metal at a specific point in the mold which, as noted before, will weaken the sand, especially where a large volume of metal is poured for large castings. One of the principles behind bottom gating methods is based on the fact that flowing liquids seek their own level and, therefore, if liquid metal is brought in at the bottom of a mold, it will seek its level without creating any degree of turbulence and distortion.

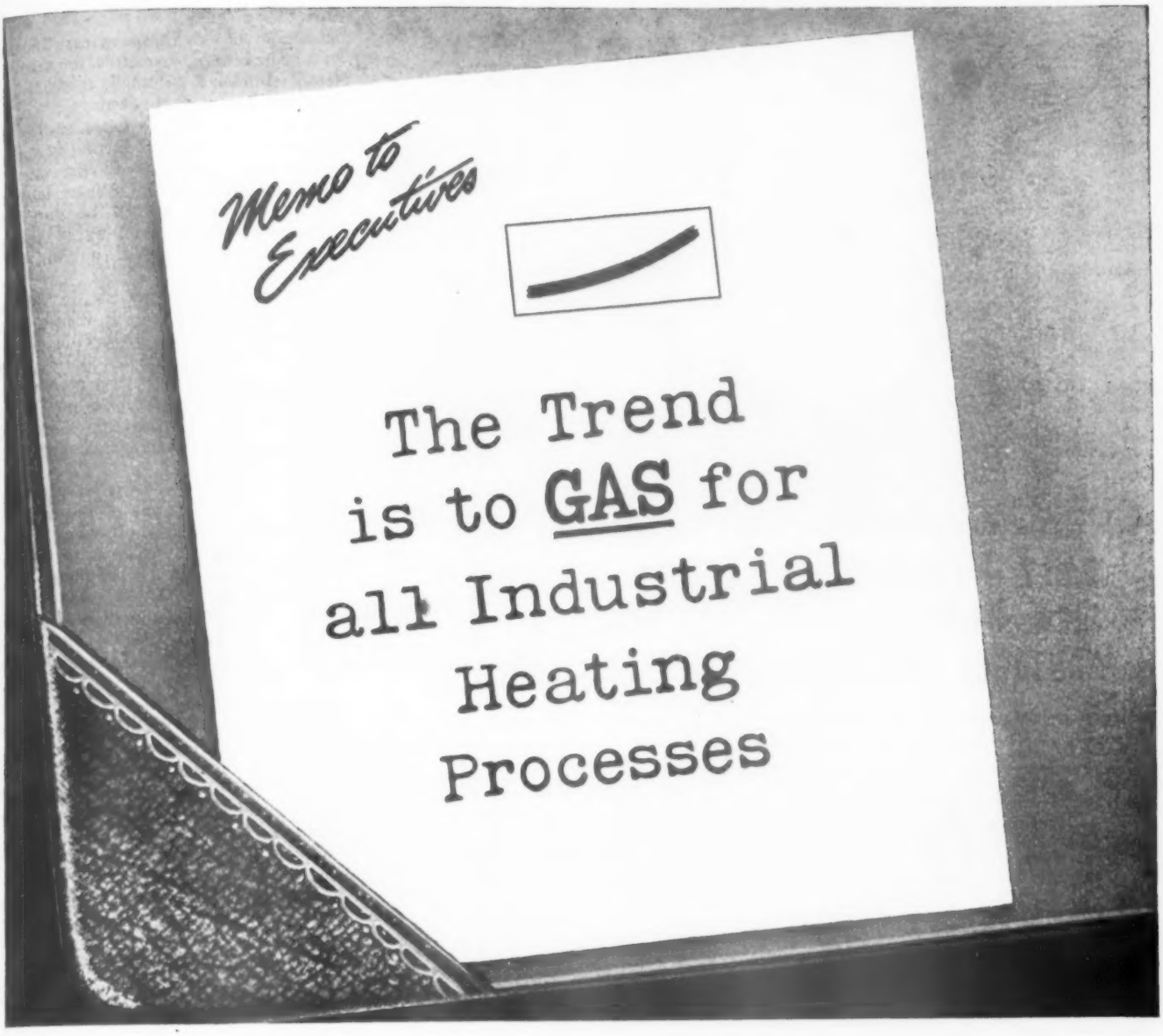
Maintain Uniform Temperature

This is true providing the gating is engineered properly by allowing the metal to enter the mold cavity at various points with the least amount of disturbance and the metal flowing through at all points is at as equal temperature as possible. We have found that in using this method, it helps the uniform rate of cooling and it helps to eliminate shrinkage, porosity or cracks between thick and thin casting sections. In some castings, it may be necessary to desert bottom gating and use top gating or feed metal at certain points of the castings where you ordinarily would not do so, on the majority of casting designs being run, but by using common sense as mentioned above on bottom gating, good quality castings can be produced.

All gates and runners should be constructed so that after the mold cavity is filled, the hottest metal is in the gates and runners in order that the gates will feed the castings, thereby eliminating any possibility of shrinkage between the castings and gates.

Risers are used extensively on bronze alloys such as aluminum bronze, silicon bronze and gun metal. A riser has a definite and specific purpose and that is to feed and supply additional hot metal to the heavy sections of a casting where it is applied and if it is misplaced or too small, it will do more harm than good. The top of the riser must always be larger than the section being fed and in many cases, it is wise to allow for topping off with hot metal to maintain a liquid core in the riser for feeding purposes. This is done mostly on the first three alloys mentioned. In the case of

(*Continued on page* 168)



For years the consumption of Gas for industrial heating processes has been steadily upward—not merely during war years but for many years before the outbreak of hostilities. There are a number of sound reasons why industrialists, including executives and production men, have turned to this modern source of heat.

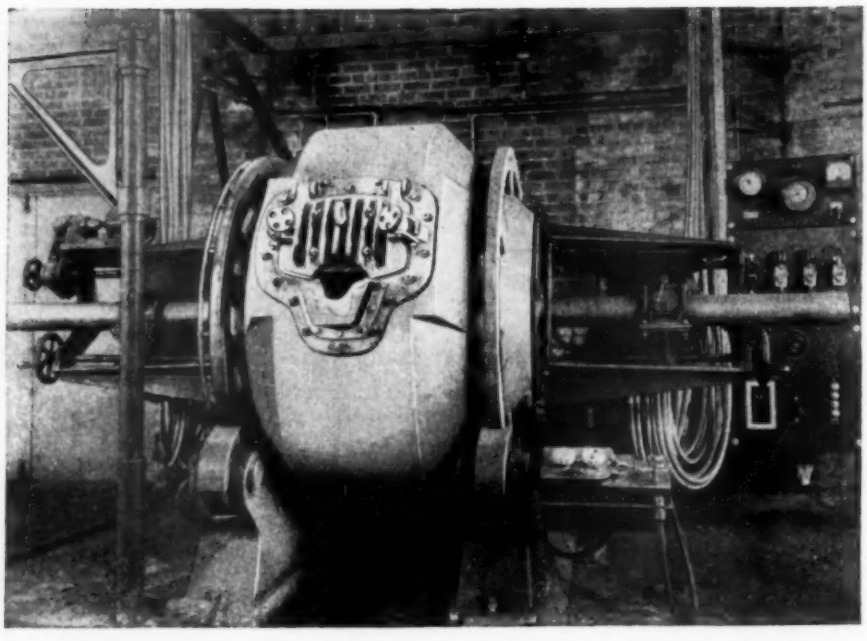
There is economy—Gas brings lowered unit and overall costs. There is speed in production—Gas is fast and saves minutes and hours of valuable time. There is improvement of product—Gas helps turn out better materials, eliminating or minimizing rejects. There is close automatic control—Gas is unsurpassed in this respect.

For these and many other qualities inherent in Gas, it is the choice fuel in the progressive plant. Details on how Gas can help solve your specific heat treating problems may be secured, without obligation, from the Industrial Engineer of your local Gas Company.

BUY WAR BONDS—SPEED FINAL VICTORY!

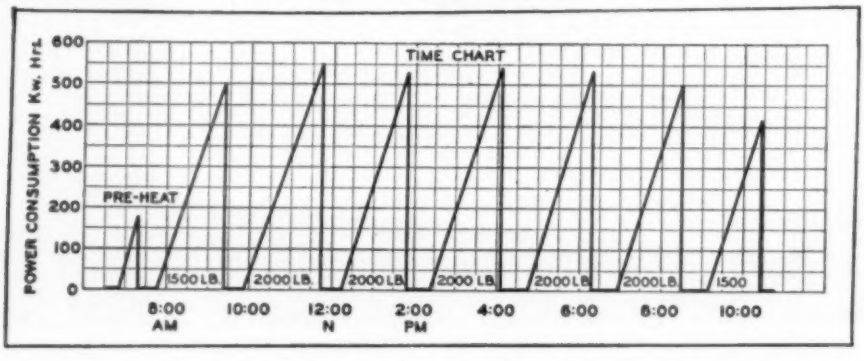
AMERICAN GAS ASSOCIATION
INDUSTRIAL AND COMMERCIAL GAS SECTION
420 LEXINGTON AVENUE, NEW YORK 17, N. Y.

THE TREND IS TO GAS
FOR ALL INDUSTRIAL HEATING



DAILY PERFORMANCE RECORD ON WHITE IRON PRODUCTION PROVES PRACTICAL ADVANTAGES OF DETROIT ELECTRIC FURNACE

Daily performance record, type AA—400 Kw.—1000 lb. Detroit Electric Furnace. Melting: White iron.



SUMMARY: HOURS OPERATION, 15; NO. HEATS, 7; TAPPING TEMPERATURE, 2900°F. TOTAL METAL MELTED, 13,000 LBS.; TOTAL Kw Hrs. USED, 3735; Kw Hrs. PER TON, 575.

Facts speak for themselves—and here are the facts taken from a daily operating record covering a typical working schedule of a Detroit Electric Furnace. In 15 hours, a 1000 lb. rated capacity Type AA Detroit Electric Furnace melted 7 heats of white iron for a total of 13,000 lbs. Allowing a half hour pre-heat period, as shown in the graph above, that means nearly a half ton of metal was produced every hour. Here is proof that Detroit Electric Furnaces are fast melting and efficient. They produce a superior metal, because their unique construction permits close control over time, temperature, composition, and other vital melting factors. Their closed chamber reduces dirt and fumes to a minimum. They are easy to operate, inexpensive to maintain. Write for further facts on how Detroit Electric Furnaces will speed economical melting of ferrous and non-ferrous metals in your own foundry.

DETROIT ELECTRIC FURNACE DIVISION
KUHLMAN ELECTRIC COMPANY • BAY CITY, MICHIGAN

(*Continued from page* 166)

aluminum bronze or manganese bronze or silicon bronze, you often run into internal shrinkage on small, medium and large uniform section castings.

It would be wise to cut a casting up into sections before production is started to acquaint yourself with the internal soundness of the casting. Where internal shrinkage occurs, it can be corrected by modifying gating, chilling or risering or more rigid control of pouring temperatures.

Aluminum gating and risering follows the same general principles as in bronze, but with a reduction in specific gravity of the alloys used, the amount of pressure in the mold cavity is correspondingly reduced, therefore, it is possible to enlarge the sprues, gates and risers used for aluminum castings as compared to bronze castings.

After gating and risering has been devised for a casting, one of the quickest and simplest methods of checking the performance of the set-up is to actually watch the action of the hot metal being poured into the mold cavity and coming up the risers. The ladle should be kept close to the sprue opening, the sprue should be filled at all times. A continuous flow of metal without turbulence or swirling will allow the metal to come up in the mold cavity and risers with a clear bright silvery color denoting the absence of dross and oxides. In doing this, you can be pretty sure of getting a usable casting providing the melting procedure has been followed properly. There may be improvements or perfections you can make in the gate but basically you are on the right track. From this point you can concentrate on lowering the pouring temperature of the metal and increasing the pouring speed.

Check the Pouring Time

In Eclipse-Pioneer foundries, we constantly check the pouring time for all types of molds using all alloys and find it important and helpful. If you can pour a mold fast but quietly in a very short time, you are reducing your scrap percentage with relation to shrinks, cracks, gas porosity, etc. We use the ratio of pounds poured per second in comparing our pouring time for various castings. We have found that invariably, we get good results on medium-sized castings if our pouring time is 4 to 8 lb per second. On large castings, our pouring time ranges from 10 to 15 lb of metal per second.

We pour a 300-lb casting in 20 seconds pouring one up and we produced some exceptionally good aluminum castings by pouring 1800 lb in 50 seconds pouring two up. These are gross weights of the castings, sprue, runners, gates and risers. The point I want to make is that a good gating set-up is the one that provides the best possible method of getting hot metal completely and effectively into the mold cavity. One of the best tools to use when engineering a gating set-up is a good imagination. If you have a pic-

(*Continued on page* 170)

P&H "HARCAST"

. . . A NEW ELECTRODE FOR WELDING CAST IRON

Foundries, large and small, now have a new aid for stronger, cleaner, better appearing products—P&H "Harcast." It comes to fill a long vacant gap in cast iron electrodes—for the welding of surface blemishes, for the fabrication of iron castings.

For all-around foundry use, "Harcast" brings entirely new characteristics that result in more satisfactory welding in all touch-up work or fabrication of parts. Use it for welding sand holes, chill holes, miss-runs and depressions resulting from removal of risers and gates. Use "Harcast" for pin holes after machining—for the joining of iron castings or iron with steel.

FOR AC OR DC WELDING

"Harcast" works equally well on DC or AC. It can be used in all positions—simplifying welding on large castings. And for the fabrication of iron castings, "Harcast" ends your worries about weld cracks, poor penetration, excess porosity or pulling away from the fusion zone.

FOR JOINING CAST IRON WITH STEELS

"Harcast" fuses well with mild and medium steels for joining with cast iron. It produces sound, dense welds—has a tensile strength of 60,000 lbs. p.s.i.—approximately twice that of a good grade of cast iron.

IS SEMI-MACHINEABLE

Because "Harcast" is used at low amperages, it minimizes the dilution at the fusion zone—improves machining qualities.

Regardless of the quantity of cast iron produced in your foundry, you will want to try "Harcast." The many important advantages of this really *new* electrode have made it the most talked-of development in years. And rightfully so. For "Harcast" reduces cast iron welding to a simple, sure level never before possible. Write for free information. P&H also offers a complete line of alloy electrodes for every requirement.

A COMPLETE ARC WELDING SERVICE • WRITE FOR BULLETIN R7-3

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SPLIT-DUCT MANIFOLDING

Buell's assurance of
HIGH EFFICIENCY, LOW MAINTENANCE, LONG LIFE

SPLIT-DUCT MANIFOLDING used in Buell (van Tongeren) Multiple Cyclones ensures *uniform* distribution of *both gas* and *dust* to the cyclone collectors. This method is most important to final collection efficiency. Uneven distribution can cause local recirculation of gas, resulting in greater erosion rates in the cyclones receiving the higher concentrations and in the impairment of collection efficiency. With Split-Duct Manifolding, a Buell design feature, maximum collection efficiency is attained by this uniform distribution of the gas load.

The outlet can be installed to discharge the cleaned gases from *any side* or *end*, a flexibility of arrangement that cannot be obtained with *unit chamber manifolding*.

Buell Dust Recovery Systems are designed to do a job, not just to meet a "spec". A promise fulfilled by Buell's high efficiency, long life and low maintenance in hundreds of installations throughout American industry.

BUELL FEATURES

SHAVE-OFF
LARGE DIAMETERS
EXTRA-STURDY CONSTRUCTION
CORRECT HOPPER DESIGN
SPLIT-DUCT MANIFOLDS
INNER WELDS GROUND SMOOTH

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HIGH TEMPERATURE RESISTANCE
UNLIMITED CAPACITY
NO MOVING PARTS
FREE DUST FLOW

PRODUCE

HIGH EFFICIENCY
LOW MAINTENANCE
LOW OPERATING COST
LONG LIFE
NO CLOGGING

buell
DUST RECOVERY SYSTEMS

JUST OFF THE PRESS: Buell's new revised book — *"The Buell (van Tongeren) System of Industrial Dust Recovery"* — now in its fourth printing, is just off the press. Write for your copy today.

BUELL ENGINEERING COMPANY, INC.
14 Cedar Street, New York 5, N. Y.
Sales Representatives in Principal Cities

DESIGNED TO DO A JOB, NOT JUST TO MEET A "SPEC"

(*Continued from page* 168)

ture in your mind of what goes on as the metal fills the mold cavity, you will get the proper angles on the gates and risers and you will see that there are traps for dross and oxides in the right places.

A moment ago, I mentioned pouring a 300-lb casting in 20 seconds. I would like to go further and describe the gating set-up of this casting. This is a dry sand mold for an aluminum diffuser casting having steel inserts cast in the ports of the diffuser. The outside diameter of the casting is approximately 4 ft and the inside diameter is about 2¾ ft. This casting is about 6 in. deep. The mold is gated from the top. We use an oblong pouring cup connected with a slot sprue. This sprue is about 4¾ in. wide, ⅝ in. thick and 6 in. high. At the base, it is flared out into a screen which covers a choke basin. The metal feeds from this basin into a ring runner about 2 in. high, 2 in. wide at the base and tapers up to about 1½ in. wide at the top. The ring runner feeds 14 equally spaced gates into the casting. These gates are 1¾ in. wide at the base and 1 in. at the top. They are 1½ in. high at the runner and taper to ¾ in. where they enter the casting. We have 14 equally spaced risers directly over the entrance of the gates into the casting. These risers are tapered from a base about 4 in. wide and 2 in. thick up to the top where it is about 6 in. wide and 2½ in. thick. The bottom or drag side of the casting is thoroughly chilled. The average wall thickness of this casting varies from ⅛ to ¾ in. We pour it at 1360 F in 20 seconds.

Gate Is Very Satisfactory

It is a bad day when we lose one of the castings. In this gating set-up, we have used sound and definite principles. Our sprue, runners and gates are constructed so that they trap dross and oxides and the proper ratio is used to handle the volume of metal necessary. Risers are placed so that they feed the casting and also contain the hottest metal when the pouring is completed. There is minimum turbulence and good distribution of the metal flow. This gate, possibly, may be improved but we are pretty contented with it. I might add that we also have some gates that we are not so proud of in case you are getting the impression that we don't have any troubles.

As a final word on gating and risering of aluminum castings, I would say that if you are constantly aware of progressive feeding arrangements, if the risers are properly placed and large enough to feed the casting, if the gate is planned so that the coolest metal is always in the mold cavity and the metal fills the mold quickly and without turbulence, you will get good results. I am assuming, of course, that all other operations are properly executed. As an afterthought, I might mention that we use a lot of screens in our aluminum molds both to cleanse the metal and for the choking action.

(*Continued on page* 172)

A Guarantee that is based on wide shop experience

When you are offered "something better at a lower price" it is quite natural to be a bit skeptical. Some foundrymen and core room foremen felt that way when we first made that assertion for Certified *Rapidry* Core Oil. Many, however, have willingly given it a trial and as a result are now constant users. These customers constantly verify that *Rapidry* Core Oil

Provides faster and more uniform mixing with any type of sand.

Is very smooth-working in the core boxes, resulting in faster production of cores.

Produces cores that can be baked in less time or at a lower temperature.

Reduces smoke and gas to a minimum either in the core room or during pouring.

Saves time in the shake-out, because cores made with *Rapidry* Core Oil are very readily collapsible.

You can test or adopt Certified *Rapidry* Core Oil without changing a single sand mixture in your core room. It functions equally well in ovens of modern or earlier types. There are several grades to produce the desired tensile strength and surface hardness of core. It will cost no more—probably less—than your present core oil and is sold on a *money-back if not satisfied* guarantee.

CERTIFIED CORE OIL & MFG. CO.

"The House of Dependability"

3308-26 South Cicero Avenue, Cicero, Illinois

Stock and representatives: Buffalo, N. Y.; Elmira, N. Y.; Worcester, Mass.; Bloomfield, N. J.; Reading, Pa.; Sunbury, Ohio; St. Louis, Mo.; Milwaukee, Wisc.; Minneapolis, Minn.; Birmingham, Ala.; Houston, Tex.; Denver, Colo.; San Francisco, Calif.; Portland, Ore.

ONE SWIFT SURE STROKE

CUTS *Non-Ferrous* GATES AND SPRUES *Faster,* AT LOWER COST!

A Tessmer Sprue Cutter in your cleaning department is the logical answer to one of your most urgent problems . . . *getting out more work with less help!*

It saves man hours and cuts costs because it converts a slow, laborious hand operation into a fast, effortless machine job. It releases valuable man power for more important work.

The Tessmer method of cutting non-ferrous gates and sprues with *One Swift Sure Stroke* results in lower operating costs for two reasons: The machine itself is so sturdy and simple in construction that it requires very little maintenance. No auxiliary dust collecting system is needed to carry off fine metal particles and dust. Write for Descriptive Folder.

Milwaukee

CHAPLET AND MANUFACTURING CO.

1025 S. 40th STREET • MILWAUKEE 4, WIS.

A 4747-3/3

(*Continued from page* 170)

Assume that we have performed all the preceding operations to a reasonable degree of perfection. We have used clean dry metal of required specifications, melted the metal under strict control using the best procedures, we have devised a gate on a pattern, constructed a sand mold, placed the cores properly, and we have poured the hot metal at the proper temperature using the proper technique. We shake out the casting and discover the following results:

1. The casting has some large and ugly blow holes. 2. It is cracked. 3. It has some shrinks. 4. It has some sand holes. 5. The surfaces of the casting are extremely rough. 6. There is some difficulty in removing the core from the casting.

All of these imaginary faults can be attributed to sand and there are other things that can happen besides those depending upon the alloy you are working with. As foundrymen, it pays to know about sand and everything connected with it. We must establish rigid controls for our sand and adhere religiously to these controls.

New High Permeability Sand

The main consideration for molding sand to be used for bronze castings is that the sands have high permeability and good green strength in order to prevent scabbing, sand washes and buckles. For our average bronze castings, a natural bank sand having an average AFA grain fineness of 110 to 120 gives us good results. On larger bronze castings we sometimes find it good practice to mix this type of sand with fire sand and use it as a mold facing. This has the effect of increasing the permeability and green strength without injuring our casting surfaces to any extent. We find that a permeability of 60 to 70 is suitable for large bronze molding. For the average bronze casting, we maintain a moisture content of approximately 6 per cent. A complex job may require a higher moisture percentage but we try not to go above 7½ per cent. Our clay content varies from 12 to 14 per cent. Laboratory tests have indicated that we get good results from a sand having green compression strength of about 4 lb per sq. in. and green shear strength of about 1 lb per sq. in.

For aluminum molding we use a natural bank sand having an average AFA grain fineness of 90 to 120 and a permeability of around 25. Due to the low specific gravity of aluminum as compared to bronze, we can work with a lower permeability. We try to maintain a moisture content of 6½ to 7 per cent average. The clay content runs about the same as the Bronze sand—12 to 14 per cent and the green strength average 44 lb per sq. in. The hot compression strength is low as is the case with most molding sands.

Core sands provide a different problem than those connected with molding sands because cores must be substantial enough to be handled and yet have good

(*Continued on page* 174)

COOLER CUTTING at Higher Speeds

THESE new Electro High-Speed Grinding Wheels afford faster cutting without troublesome heat development whether the grind is for snagging or for fine finishing.

We believe that war demands made it possible for ELECTRO to show cooler cutting at higher speeds, and present high state of perfection will be the basis for further gains. All we ask is opportunity to prove the cooler cutting at higher speeds of our wheels.

Will you wire us?—or phone us at Buffalo, WAshington 5259?

K-310

Electro TRADE MARK SINCE 1919

REFRACTORIES & ALLOYS CORPORATION

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344 DELAWARE AVENUE BUFFALO 2, NEW YORK

WEST COAST WAREHOUSE

MALUMINUM MASTER FLUX and IRON LADLE COMPOUND

The master casting flux for

BRASS—BRONZE—ALUMINUM—IRON

Maluminum is preferred because it:—

1. ALLOWS LOWER POURING TEMPERATURES.

- Less shrinkage in castings.
- Fewer shrinkage cracks.
- Fewer blowholes.

2. MAKES METAL MORE FLUID.

- Fewer misruns.
- Porosity reduced to a minimum.
- Greater density in castings.

3. KEEPS YOUR LADLES CLEAN.

4. ELIMINATES OXIDES AND OTHER NON-METALLIC MATERIALS.

- Thoroughly cleans metal.
- Less pitting.
- Neutralizes zinc fumes which cause brass chills.

5. ELIMINATES DROSS PILE LOSSES.

- Dross skimmings are powder containing practically no metal.

6. CASTINGS WILL MACHINE AND POLISH BETTER.

Maluminum has served the foundryman for 25 years —Used by the U. S. Government, Railroads, State Universities and hundreds of foundries throughout the United States. It is a tried and proved product.

Manufacturers and Distributors

DOCKSON CORPORATION
3839 Wabash • Detroit 8, Mich.

(*Continued from page* 172)

permeability and collapsibility. Because cores must be baked, cleaned and possibly assembled, we find it more of a problem to maintain close casting tolerances on cored surfaces than on green sand surfaces. I have known core shops where every coremaker in the shop had his own core sand mixture and yet the cores produced would make suitable castings. This was due partially to the fact that different castings require different mixtures but even at that I have noted wide differences of opinion as to proper core sands and mixtures even for the same job. When you are running a semi-production foundry, it becomes apparent that it is necessary to settle on a few standard mixtures and sacrifice some of the finer points in the interest of production.

Our bronze castings are produced in a foundry where we also make aluminum castings and I frankly admit that in our core department of this foundry, our aluminum core practices are liable to affect our bronze cores unless we are careful. We sometimes find that our bronze cores allow penetration of metal, resulting in rat tails and rough surfaces if we are not cautious.

Use Oil and Cereal Binders

We use a washed silica sand having a grain fineness of 50 to 60 for bronze cores. We maintain a moisture content of 3½ to 5½ per cent for bench core jobs and 1½ to 2 per cent for core blowing sand. The core sand mixture is composed of 1 part core oil, 1 part cereal binder, 100 parts silica sand, or an average of 1 to 50 by volume. We use cereal binder for green strength in all bronze cores. A ratio of 1 to 40 is used for large cores.

On large bronze cores, it is sometimes necessary to use a good commercial core wash to restrain penetration of hot metal and get a smooth casting surface. However, we must be careful not to use too much because it will lower the permeability of the core. If we use too little core wash, we may get peeling of the surface of the core and thus defeat the purpose of using it.

In core blowing machines for aluminum and magnesium cores, we use a round grained silica sand (AFA fineness 80). This sand gives a high permeability and a smooth finish. The sand is mixed in the ratio of 48 parts sand to 1 part oil. It has a low green strength and a tensile strength of about 100 lb sq. in. Little or no water need be added to this mixture. This round grained silica sand also has less wearing effect on metal core boxes.

Core sand for hand ramming consists of a mixture of equal parts of AFA fineness 80 round grained silica sand and AFA 169 sharp grained silica sand. We use 56 parts sand to 1 part oil mixture with ¼ quart of cereal binder added to increase green strength. This mixture of course, can be varied depending upon the type of core to be made.

Our core baking temperatures range

(*Concluded on page* 178)

"The most TROUBLE-FREE Foundry Unit I ever had in my Foundry!"

MEMBER
MANUFACTURER'S ASSOCIATION INC. FOUNDRY EQUIPMENT

This is a direct quotation from a statement made by the General Superintendent of a large Eastern steel foundry. A SIMPLICITY 8′ x 10′ Dual Shake-Out, such as illustrated by the cut, is the machine covered by the quotation. The 8′ x 10′ Dual Shake-Out was installed in this steel foundry in 1942 and has been in active service since that time. The first SIMPLICITY Gyrating Shake-Out was installed in a malleable iron production foundry in March 1933. Since that time 53 different sizes and models of shake-outs have been built to meet customers' requirements. Today, SIMPLICITY Shake-Outs are operating in 310 gray iron foundries, 188 steel foundries, 130 non-ferrous foundries and 40 malleable iron foundries. The SIMPLICITY Gyrating Shake-Out filled the urgent need for a high speed, efficient flask shake-out and casting knock-out unit. These points were bottlenecks in nearly every operation, before the SIMPLICITY units were installed.

Simplicity
TRADE MARK REGISTERED

ENGINEERING COMPANY
DURAND, MICHIGAN

Turn to the pioneer for

Expert Counsel

on peacetime production plans

WITH material and manufacturing costs at a new high level, competition in the postwar era promises to be more keen than industry has ever known before.

Manufacturers who realize this are taking steps *now* to make certain that their postwar programs take full advantage of the newest and most efficient manufacturing tools and processes available.

In the field of abrasives, it is only natural that they should turn to Peninsular—the pioneer in grinding wheel progress.

Today, as always, Peninsular is maintaining its position of leadership through the same endless study and research which has resulted in the development of new materials for abrasive wheels—new methods for their manufacture—new means for their application to industrial problems.

A STANDING INVITATION

Our expert staff of factory and field engineers are ready today to help in your postwar preparation—with a production, engineering and cost analysis service beyond any offered up to now in the industry.

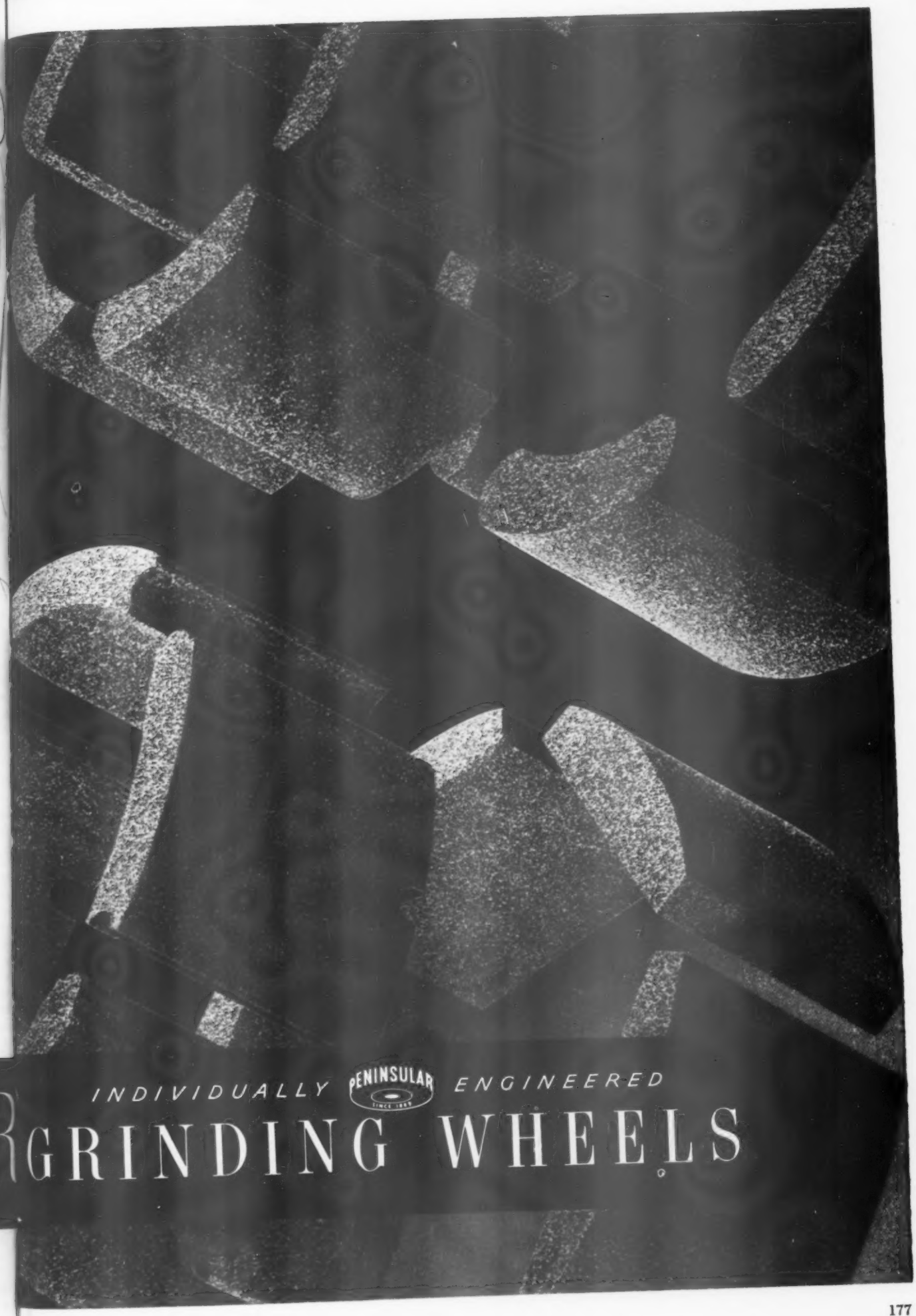
The Peninsular Grinding Wheel Company, 729 Meldrum Ave., Detroit 7. *Sales Offices:* Chicago, Philadelphia, Cleveland, Newark, Pittsburgh.

SPECIALISTS IN RESINOID BONDED WHEELS

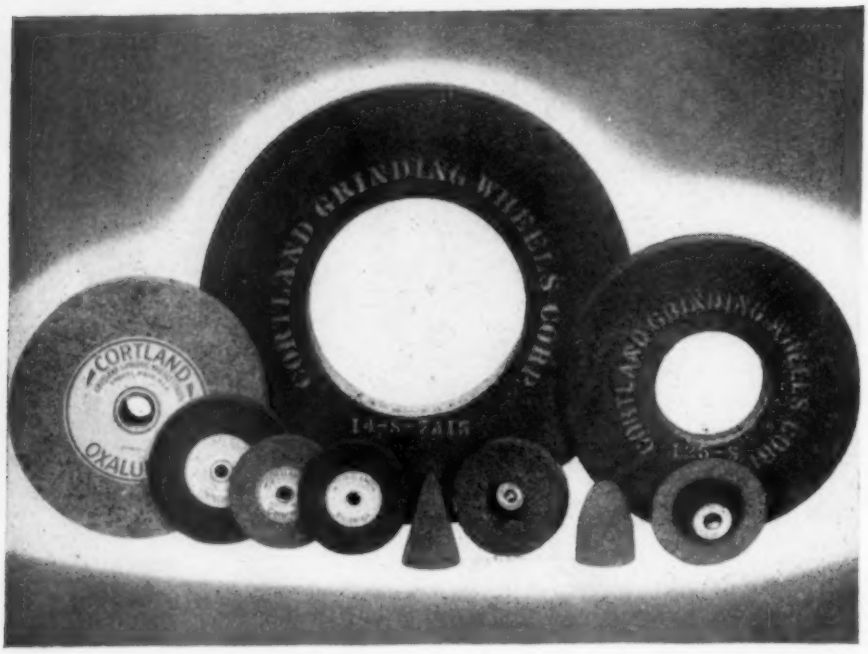
PENINSULAR

SINCE 1889

Various types of segments used for surface grinding.


INDIVIDUALLY PENINSULAR ENGINEERED
GRINDING WHEELS

The Foundryman's Choice . . .



Cortland Snagging Wheels

It's a safe bet that Cortland has exactly the one you need, for the Cortland line includes Snagging Wheels in all sizes — all types. Mount them on floor stands or swing frames — or use them on portable grinders — you'll get rapid stock removal — longer wheel life — cooler grinding action on all types of castings, if you follow the recommendations of Cortland Engineers.

The Cortland policy is one of suiting the wheel to the job and its engineering and production facilities stand ready to work with you to that end.

Write freely about your problems to

CORTLAND GRINDING WHEELS CORP.
6 Cortland Street
Chester Mass.

For Better Snagging

CORTLAND

(*Concluded from page* 174)

from 400 F to 450 F. We must always be aware of such points as the following:

1. The lower the ratio of sand to oil, the higher the strength and the lower the permeability and collapsibility. High hardness in cores causes shrinkages and cracks in castings. Low permeability cores result in blow holes.

2. Use vents wherever necessary. Too much moisture reduces permeability and too little moisture will allow the core to air dry and disintegrate.

3. Cereal binders reduce permeability as compared to oil but be sure that when you use oil that it is completely oxidized during baking.

BRITAIN'S "VOLCANO" BOMB

(*Continued from page* 109)

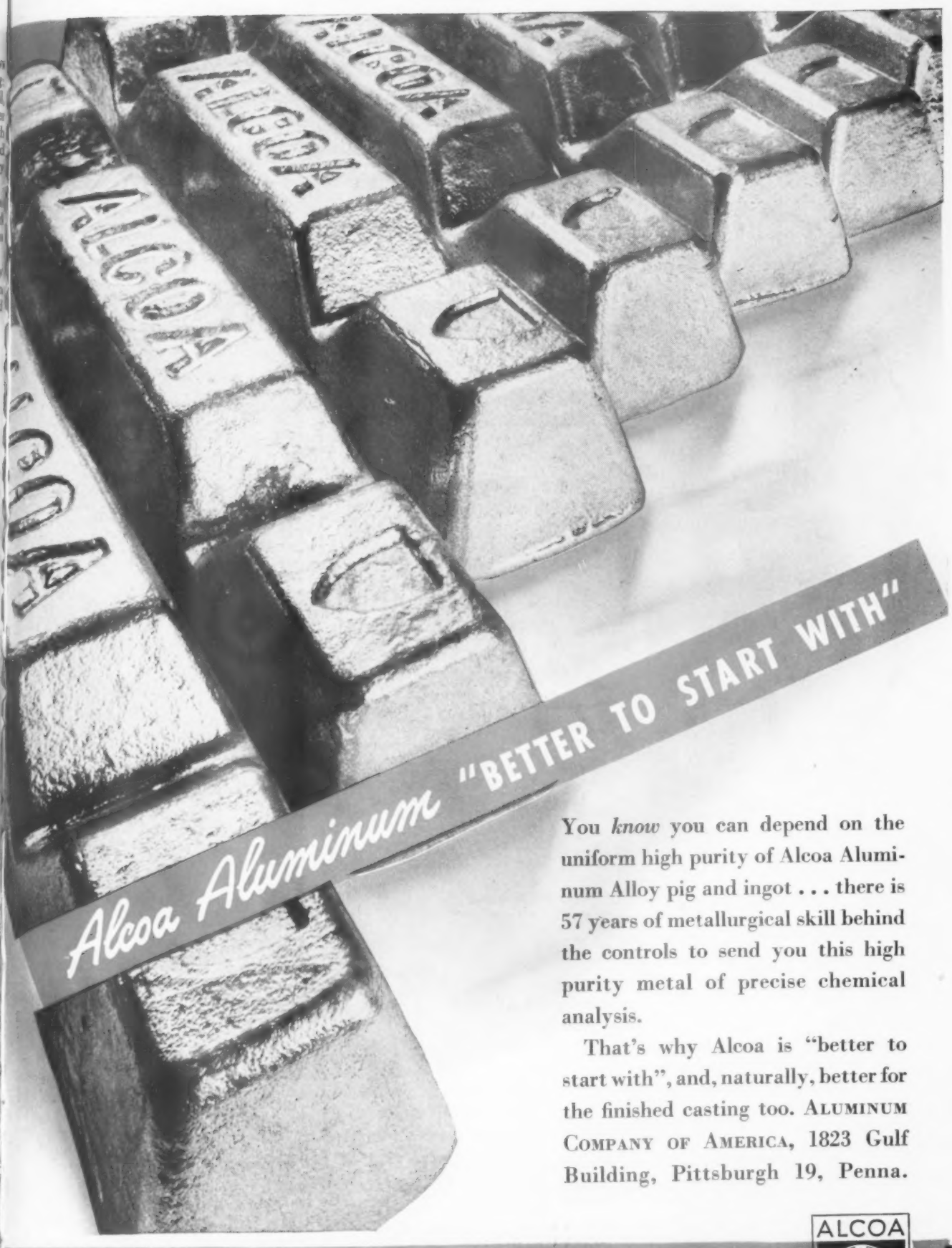
Experimental trials of the 11-ton bomb were carried out with scale models. A full-size loaded case was dropped at an experimental station in England, and a force of 18 men is said to have worked 12 hours per day for nine days to dig it out. The test verified previous calculations. A real loaded bomb was dropped on a small granite island off the British coast. The island literally was blasted out of existence. A final test dropped a bomb in ordinary soil in southern England. Observers a mile and half away saw 10-ton clumps of earth hurled into the air. Total displacement was several thousand tons.

One of the main problems was to get a plane to carry the bomb. By various devices it had been fitted to a Lancaster for experimental purpose. It had to be modified before it could be carried to the continent under operational conditions with full crew and ammunition aboard. A new bomb trolley and special hoisting tackle were designed and manufactured.

Accompanying illustrations, shown through the courtesy of the British Information Services, indicate several steps in the production of the huge, presumably steel, castings. As with practically everything released in this manner for general distribution, many interesting features from a foundry standpoint, are not touched upon. Basing an opinion on the given weight, 11 tons, and estimating backward, it seems fair to assume that the casting is approximately 4 ft in diameter, 15 ft in length, with a metal thickness of 3 in.

The mold is made upright in an octagonal flask in a pit, and parted about half way to facilitate setting the core later. A sprue on opposite sides conducts the metal to a point near the bottom of the mold. The point of the pattern rests in a depression in a metal plate. This same depression serves as a guide for centering and supporting the core later. The neck of the casting is extended upward to serve as a feeding head. A gap in the side of the feeding

(*Continued on page* 180)



You *know* you can depend on the uniform high purity of Alcoa Aluminum Alloy pig and ingot . . . there is 57 years of metallurgical skill behind the controls to send you this high purity metal of precise chemical analysis.

That's why Alcoa is "better to start with", and, naturally, better for the finished casting too. ALUMINUM COMPANY OF AMERICA, 1823 Gulf Building, Pittsburgh 19, Penna.

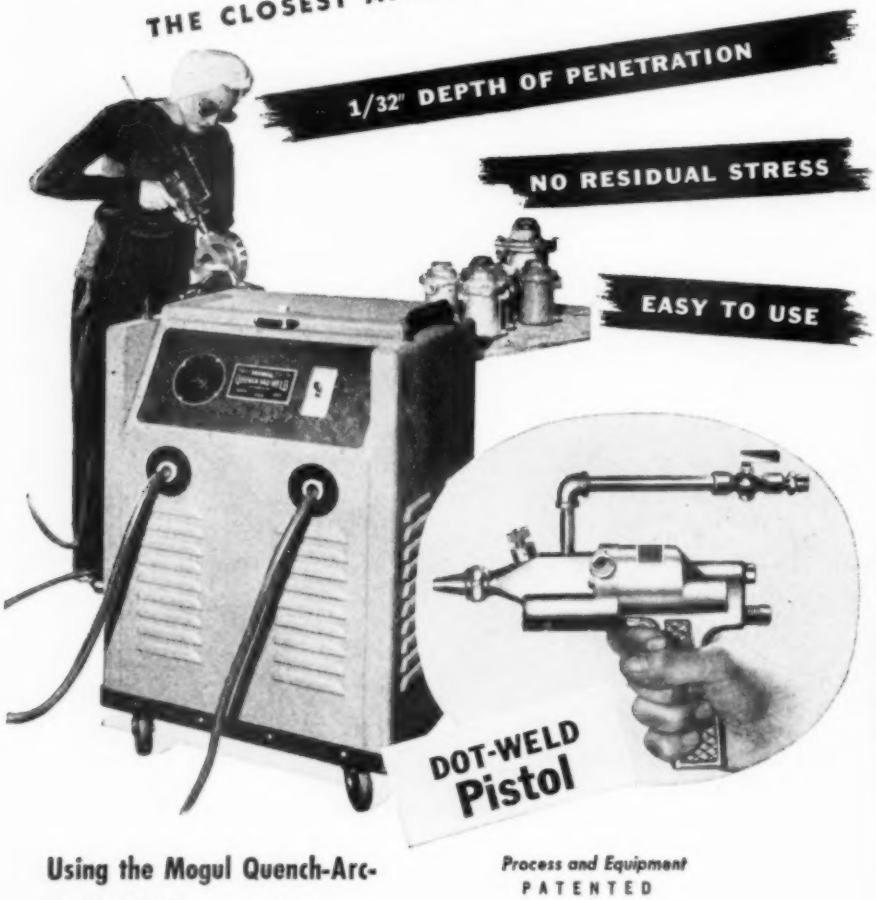
ALCOA FIRST IN **ALUMINUM**

ALCOA ALUMINUM

Salvage Defective Castings by the New Mogul

•DOT-WELD PROCESS

THE CLOSEST APPROACH TO A COLD WELD



Using the Mogul Quench-Arc-Weld Machine and the Dot-Weld Pistol

Process and Equipment
PATENTED

Now you can reclaim defective ferrous and some non- ferrous castings without fear of setting up residual stresses, or crystallization by the Dot-Weld Process. It affords a fast fill-in of aluminum, nickel, bronze or zinc which can be applied to any metal and is readily machineable. In addition to reclaiming defective castings, Dot-Welding is being used for press fit work, local nickel clad to eliminate corrosion and other applications never before possible.

DOT-WELDING UTILIZES the new Mogul Quench-Arc-Weld Machine, a high amperage, low voltage transformer and the unique Dot-Weld Pistol. This combination affords a depth of penetration up to 1/32" yet the specially designed air pressure unit of the pistol quenches the arc in a constant stream of cooling air.

No foundry, machine, welding or pattern shop can afford to be without the remarkable Dot-Weld Process.

METALLIZING COMPANY OF AMERICA
INDUSTRIAL DIVISION
1330 Congress Street, Chicago 7 135 Cedar Street, New York 6

WRITE FOR NEW BULLETIN

(*Continued from page* 178)

head permits the first metal which appears, to flow over the side. The head then is filled with hot metal.

Probably the most interesting features from a foundry standpoint are the methods and equipment employed in making the large core, as shown in Fig. 3. This core must conform to strict specifications in size and shape, must be readily removable from the casting, produce a smooth, clean skin on the inside face of

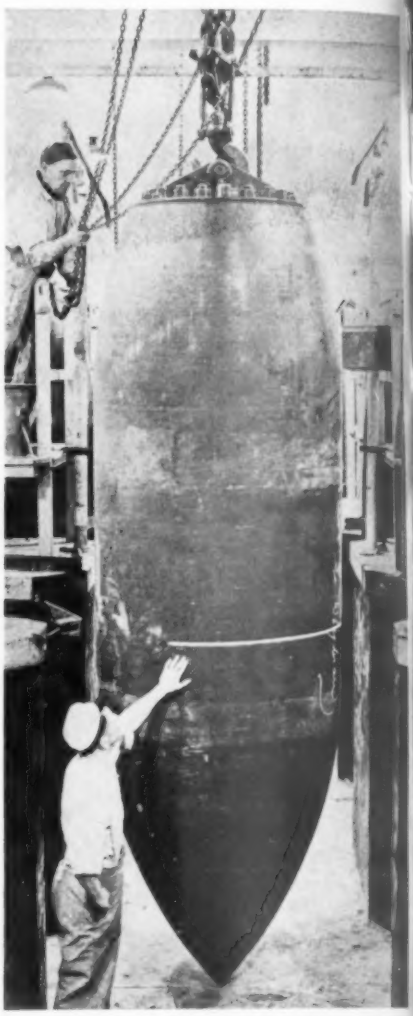
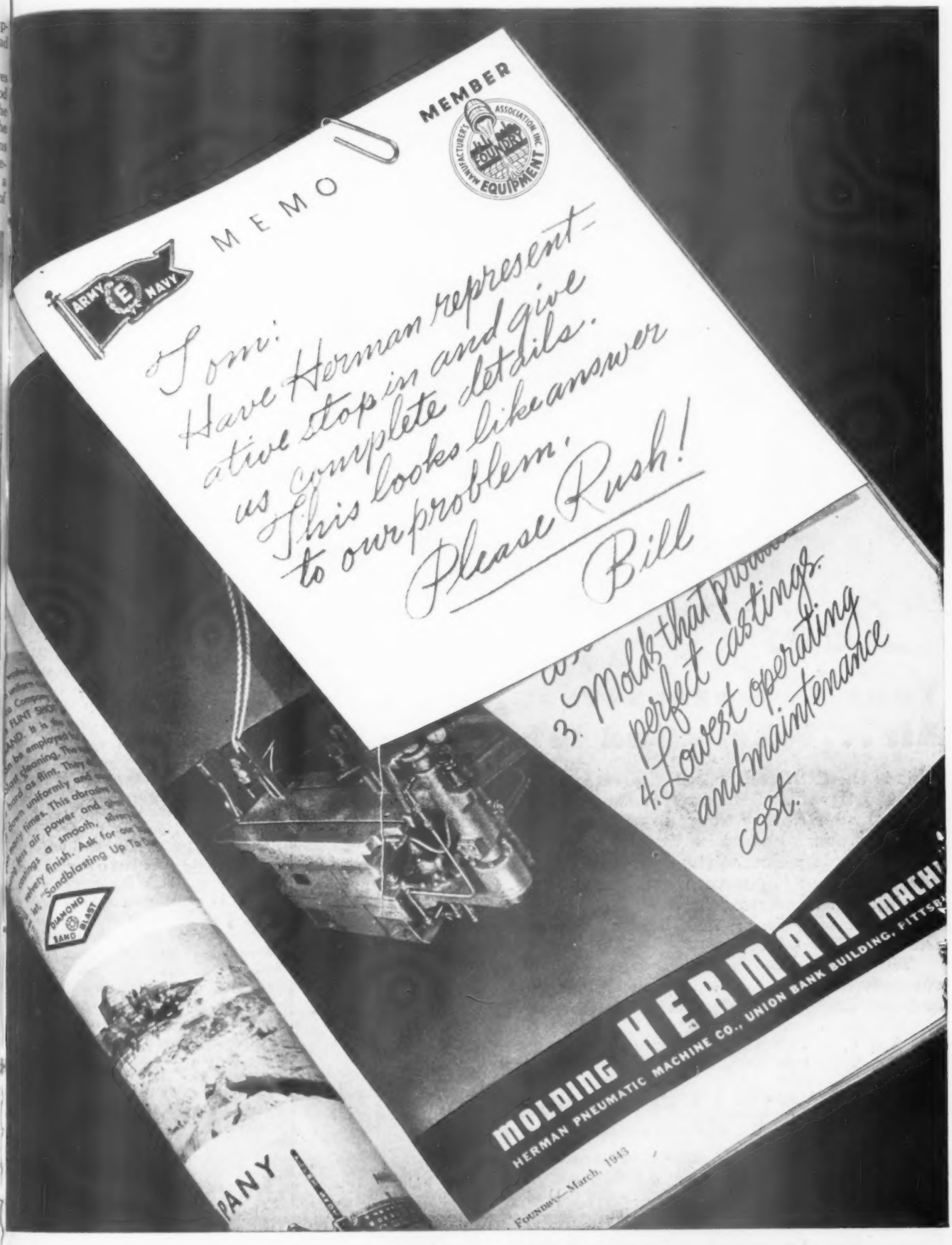


Fig. 4—Pits are necessary to accommodate the huge size of the bomb while being filled with explosives

the casting, and must conform accurately to the outside contour. Inside and outside walls of the casting must be concentric and the thickness of the wall must be uniform.

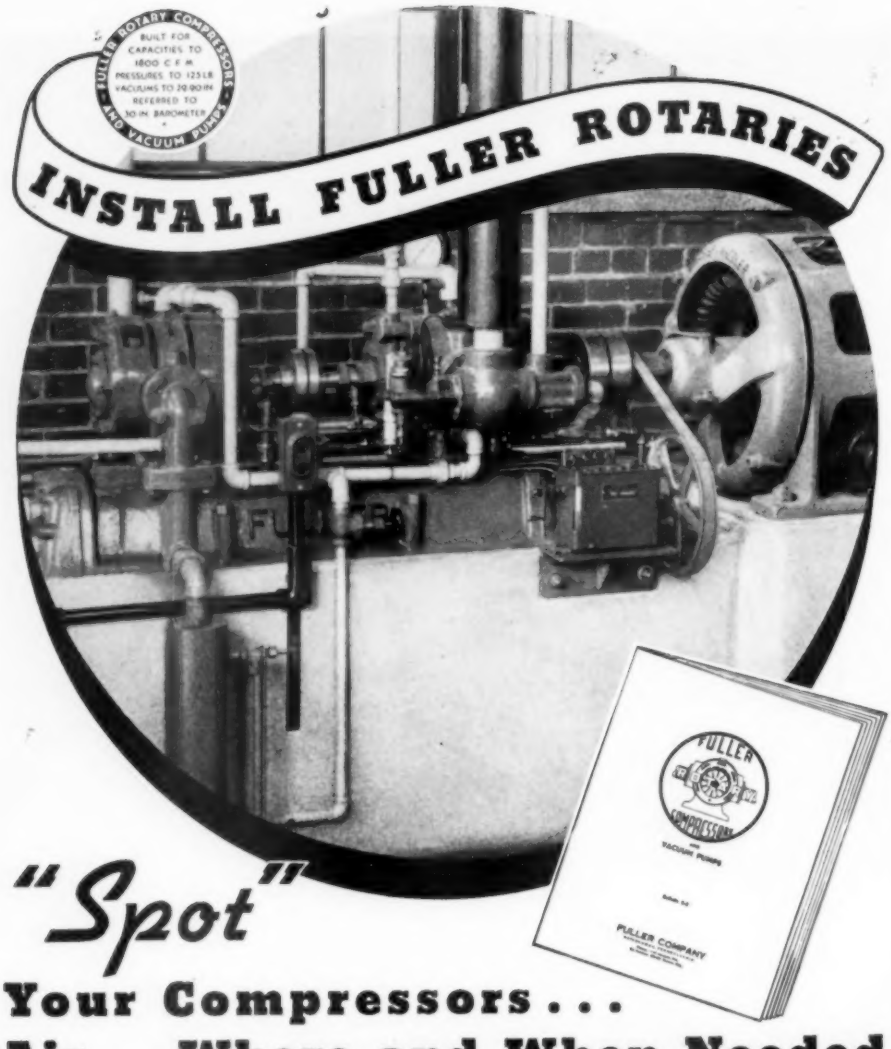
The main part of the arbor is a heavy steel pipe through which numerous holes have been drilled to facilitate escape of gas when the core is surrounded by molten metal. Part of the pipe at the upper end of the casting is left bare to serve as a bearing when the core is revolved in course of construction. The remainder of the neck as far as the point where the core is increased in diameter, is covered first with a strand of rope and then with a coating of loam. Practi-

(*Concluded on page* 182)



MOLDING **HERMAN** MACHINES

HERMAN PNEUMATIC MACHINE CO., UNION BANK BUILDING, PITTSBURGH, PA.


FULLER ROTARY COMPRESSORS AND VACUUM PUMPS
BUILT FOR CAPACITIES TO 1800 C.F.M. PRESSURES TO 125 LB. VACUUMS TO 29.90 IN. REFERRED TO 30 IN. BAROMETER
INSTALL FULLER ROTARIES
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COMPRESSORS
AND VACUUM PUMPS
FULLER COMPANY

"Spot"

Your Compressors . . .
Air . . . Where and When Needed

This is the fifth and last of a series in which we have endeavored to set forth some of the outstanding qualifications and advantages of the Fuller Rotary Compressor. Necessarily our story in these advertisements had to be very brief.

We should welcome the opportunity to discuss advantages for your plant to: *"Spot your compressors . . . have your air when, where and as you need it."* We have every reason to believe you will profit by such an installation, as many others have done in the past few years.

The installation shown above proves our point . . . a two-stage compressor which was operated 23 hours per day for four years, and not one cent was spent for repairs or replacements.

Bulletin C-5 illustrates and describes these machines. It's yours for the asking.

FULLER COMPANY
CATASAUQUA, PENNSYLVANIA

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Washington 5, D. C. · 618 Colorado Bldg.

C-113

FULLER
PIONEERS OF HIGH-EFFICIENCY ROTARY COMPRESSORS

(*Concluded from page* 180)

cally the same process is repeated at the opposite end where the core comes to point. A steel pin screwed into the end of the arbor serves first as a bearing for this end, and later as a pedestal for supporting the core in the mold. In the mold the pin is protected by a special refractory sleeve.

Remainder of the arbor is reinforced with a number of rings set about feet apart and wedged tightly to the steel barrel. Longitudinal rods attached to the rings maintain the latter in proper position and also form a frame or scaffolding for the wood shaving rope that is applied as a foundation for the loam. One man revolves the barrel with a large hand wheel attached to one end, while a second operator applies the rope in a uniform and constant spiral. A coating of loam is applied to the entire surface, followed by second thickness of rope and another rough coating of loam. When the core is revolved, a long strike board mounted horizontally at the center line, removes the excess loam and brings the core to approximately the desired shape. After the coating of loam has stiffened a finishing coat of fine loam is applied and swept to form a smooth and uniform surface.

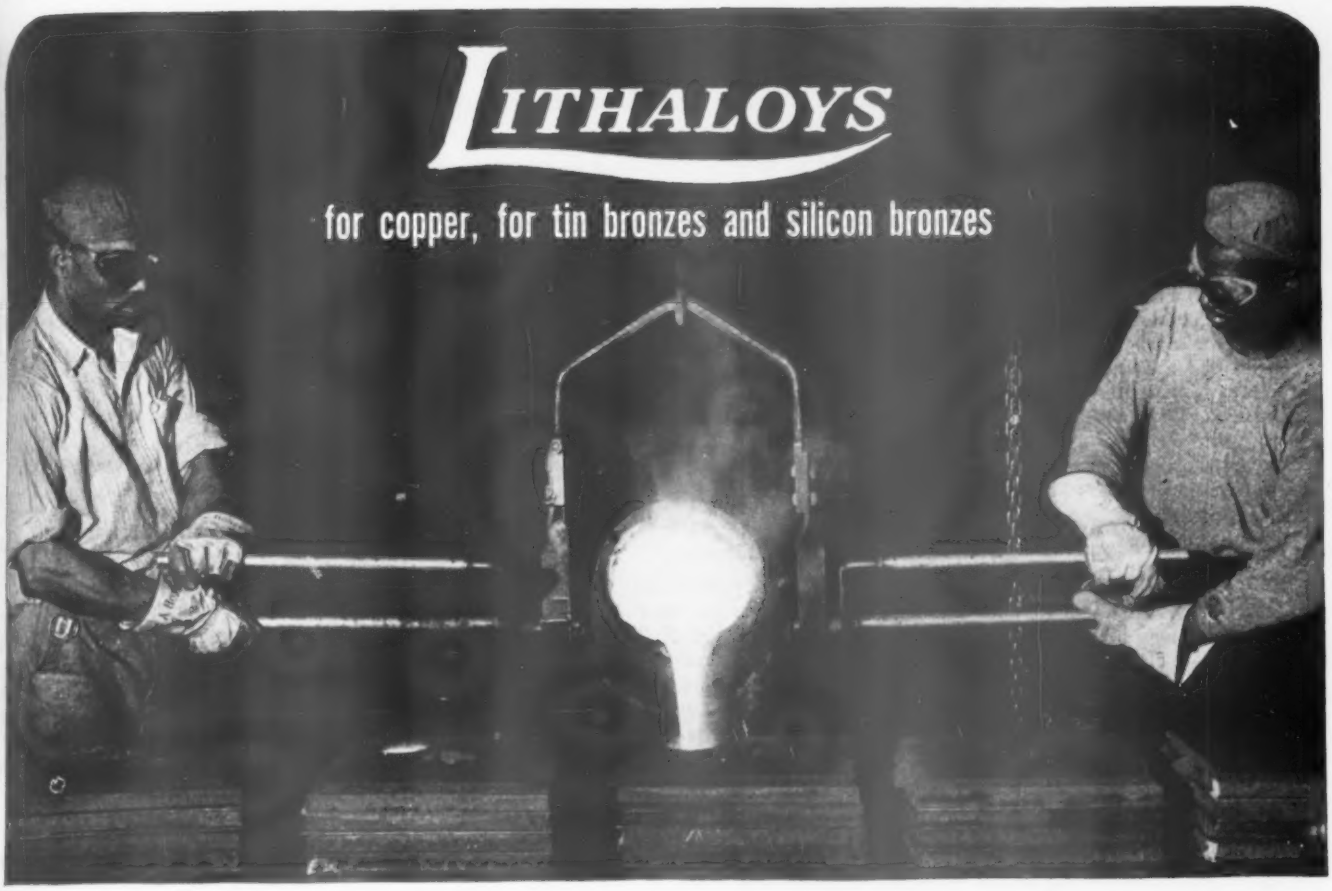
Cores Lowered Into Molds

After the cores are dried in the oven a yoke is attached to the neck and the cores are suspended from a rack from which they are lifted by a double hook crane and lowered into the molds. Details of these features are shown in Figs. 1 and 2. With the core resting on the bottom pin and held in a central position temporarily with wood wedges, the yoke and crane are released. The remaining members of the mold section are lowered into place and then a yoke is placed on top to anchor the core, to hold it truly in the center, and to prevent it from rising when the mold is filled with metal.

Ends of the yoke rest on opposite sides of the upper flask flange and are held rigidly in place with clamps and steel wedges. The upper end of the arbor neck is wedged under the elevated part of the yoke. After the casting has solidified, the wedges are released to permit expansion of the core and core barrel. A 3-inch diameter short steel shaft attached to the core arbor extends upward through an opening in the center of the yoke to hold the core in the center of the casting. The shaft fits loosely in the opening to permit any necessary minor adjustments by means of small wedges.

Issues Computator

National Engineering Co., 549 West Washington boulevard, Chicago 6, has issued an interesting computator in slide rule form for determining molding cost. In addition, the other side of the computator permits determination of the number of molds to be made up, pounds of metal required for pouring, and volume of a mold.



Better Castings . . . Increased Output *with* Same Equipment . . . Same Crew

. . . are being obtained by foundrymen who are using the metal Lithium for ladle treatment . . . because Lithium metal degasifies and deoxidizes thoroughly, eliminates porosity and gas cavities, scavenges slag and oxides, improves fluidity and thus often permits lowering pouring temperatures.

And the use of Lithium does not upset your normal foundry procedure. A small amount of Lithium, compounded with the same metal as your casting, is added to the melt a *few* minutes before pouring—that is all.

Lithium does its job by combining with hydrogen, nitrogen, oxides, sulphides and other non-metallic impurities. The compounds so formed are of non-metallic nature and have low specific gravity. They are insoluble in the metal and flux out quickly. Thus your castings are improved by Lithium but do not retain any appreciable quantity of it.

* * *

Write LITHALOYS CORPORATION, recognized authority on Lithium, for information.

LITHALOYS CORPORATION

444 MADISON AVENUE, NEW YORK 22, N. Y.

READERS' COMMENT • • •

Suggests Procedure

To the Editors:

I always read the Questions and Answers section of The Foundry with interest. Sometimes I wonder just what type of foundrymen send in the questions. Some of the questions are very good and are one way to pick up many ideas. Sometimes it seems to me as though some foundrymen are trying to reap the harvest of others' hard work, those who dared to experiment in the art of casting metals. The war has made changes in foundries and has shown foundrymen that the old-fashioned ideas and methods need a change. The days of "What was good enough for my father is good enough for me" are gone. As time marches on all must make changes—including foundrymen.

In reference to the question titled "Hollow Bushings Are Full of Porosity," which appears on page 112 of the June issue, it appears that if the inquirer would just open his mind to a bit of modern foundry practice, he could solve his problem easily. I'm not the best foundryman, but I have experimented in the nonferrous field in which I am interested. I believe the answer to the problem is a set of permanent molds and an electric furnace. In one foundry with which I was associated thousands of tubes were poured in permanent molds, and bushings could be poured just as well.

The molds could be made of cast iron or copper alloy. In the latter case the mold will have to be water-jacketed. Mold facing should be tallow or lard oil. Suggestion given in the answer on making the core is excellent. The mold should be vertical and poured from the top to eliminate gates, runners or risers. Mold should be about 4 in. longer than the desired length to compensate for shrinkage. A plug with a hole in it should be placed at the bottom of the mold to center the core, and at the top a ring would serve the same purpose. The pouring strainer would be set on top of the ring. Size of holes in the strainer will depend on the alloy and the temperature of pouring.

When using a cast iron mold it should be heated to about 200 F. Cycle of operations will keep the molds warm, and with a little care the molder will know how much cooling is required. When using a copper alloy mold with a water jacket, the water should be turned on just before pouring begins and left running until pouring is completed. Temperature of the water should be about 220 F. With that practice the molder may begin to recoat the mold as soon as the casting has been removed as the water has cooled the mold sufficiently. Use of a water-jacketed copper mold has the advantage that when damage occurs the shell or lining can be replaced. Use of an electric furnace in my opinion will eliminate gas pick-up during the melting cycle.

Before entering the Army I was interested in the nonferrous field, and experimented with the so-called investment process. I believe there is a great future for that type of molding. Some day I hope to start up a small casting plant of my own.

Corp. Louis M. Wick,
Co. F, 1303rd Eng. Regt.

Ain't It The Truth?

To the Editors:

Please present my congratulations to Pat Dwyer on his *Adventures of Bill* in the June issue of The Foundry. It is a masterpiece and brings back vivid memories of the time I bossed the cupola and yard gangs in an eastern foundry. What with three cupolas, two charging cranes, briqueting machine, coke hoist and a railroad *derk*, and with gangs composed of representatives of practically every known nationality—but thank God, no women—there were very few dull moments.

George Gibby

Winthrop, Mass.

The Army Way

To the Editors:

Referring to an editorial in a recent issue of The Foundry, I would like to point out that the Army, seeking both men for the army and sufficient quantities of casting, sometimes get neither.

I am 36, not suited for use in the infantry, and physically disqualified for duty as an aerial gunner, but just right for any moronic occupation the Air Force sees fit to give me. For the past 18 months, that has been duty in the psychological examining unit. Any Wac could handle with dispatch and efficiency, any job in it. I got the job, not because of my psychological background (I have none); not because I am a washed-out flying cadet (I am not that either, though being one is considered good reason to put a man in the program); I am in the outfit because on the basis of the Army's version of an intelligence test (which it is not) I am a very intelligent fellow. And that was a mistake from the beginning, because while some parts of this program may require training in psychology, no part of it takes intelligence, not even the GI variety.

On the other hand, I was a pretty good sand man, especially in research. For some years I worked for a sand producer, which was a fine education, and an opportunity for much research.

For example, car wheels were running light so regularly that the superintendent concluded that patterns had shrunk, and so he was getting new ones. That was my first actual service job, and I was lucky enough to discover that if the sand mixture was changed extremely, the weight of a 750 pound wheel would increase to 800 pounds.

There were a lot of jobs of a similar nature that followed that one; sometimes the castings were too small and sometimes they were too large. In the end, I had collected considerable data on casting dimensions as affected by sand.

I think that research reached its peak when a New England foundry reported that three weeks of investigation into metal and molding practice had failed to provide a cure for shrink holes in small bosses on the drag side of light plates. The cause obviously lay in excessive mold deformation; when hot deformation was reduced, the trouble disappeared. Immediately after that I observed that cope defects in a certain type of plate could be cured by eliminating facing material from the facing sand, for the apparent reason that conductivity was thereby increased.

One day I showed a well known metallurgist a new fine-finish facing mix for gray iron. He tried it; it worked. He proudly showed the resulting casting to a brass hat, and the brass hat said N. G. The surface was so smooth he feared the paint wouldn't stick.

So I can make castings, or rather, I can make the sand to aid in making the castings that satisfy the dimensional requirements, and in the field of light castings, the surface will be so smooth that one coat of paint will cover. All this of course, with low-loss, highly durable, synthetic sand.

I say I can do it, but I mean I could do it if the Army didn't seem better pleased to have me engaged in learning to perfection the gentle art of becoming a totally useless moron. By the time I get out, I will be able to take and hold my place in the forefront of those most perfectly suited to relief.

A Salesman

Sound Advice

To the Editors:

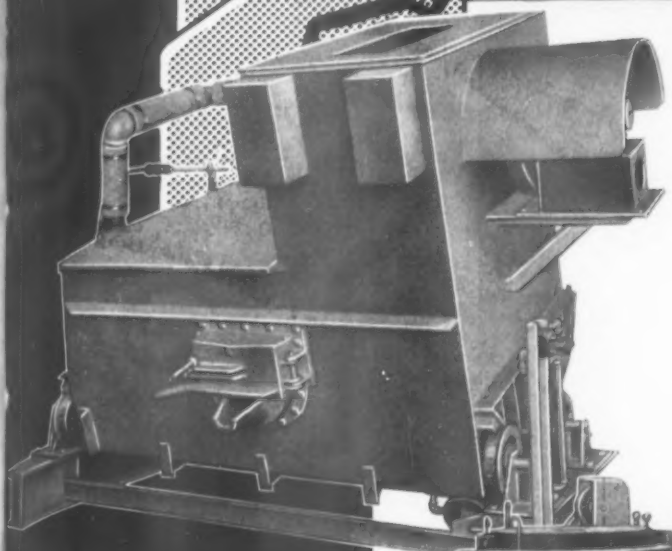
Your editorial in the August issue is constructive, sound advice which would benefit foundrymen and not prove unhelpful to the equipment industry.

I hope that your advice is generally followed.

Arthur J. Tuscany,
Executive Secretary
Foundry Equipment Manufacturers' Association, Inc.
Cleveland 14

Vilter Mfg. Co., Milwaukee, has been reorganized as a nonstock corporation, will all net profits to be used primarily for scientific research, for the benefit of employees, for the rehabilitation of war veterans and for educational purposes.

3 Efficiency Plus MELTING FURNACES

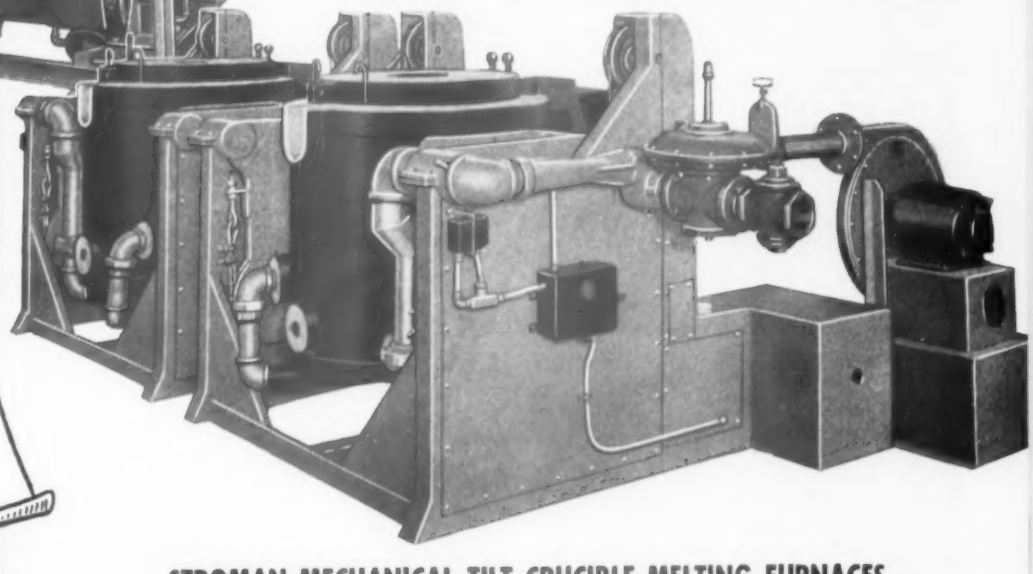


SKLENAR NON-CRUCIBLE, DIRECT FIRED IMPROVED REVERBERATORY MELTING FURNACE

For melting Brass, Copper, Aluminum, Ferro-Manganese and special cast iron alloys.

In this great furnace that has won acclaim throughout the British Empire, metal is charged into a hopper which is also an exhaust from combustion chamber. Here the metal is preheated and melted at the throat of the hopper. The cold metal does not reach the molten bath. Charging is continuous and it is not necessary to shut off the flame to charge additional metal. These features make for fast melting and greatest fuel economy, as combustion chamber is heated by the same fuel that is used to melt the metal in the throat of the hopper. It is exceptionally cool for the operator to work around. Tilting mechanism may be either mechanical or hand tilt according to the size of the furnace. It may be fired by Oil or Gas, and capacities range from 350 to 10,000 pounds of Brass.

Bulletin No. 501 gives complete information, send for it at once.



REMEMBER . . . Stroman makes furnaces of all types and all sizes for the melting of Brass, Aluminum, Magnesium and all other types of non-ferrous metals. Their engineers will gladly consult with you on any or all your melting room problems.

STROMAN MECHANICAL TILT CRUCIBLE MELTING FURNACES

For Brass, Bronze, Aluminum and other non-ferrous metals. Combining such outstanding and exclusive features as Stationary Lip Pour, which eliminates the necessity of shifting the ladle at any time during the entire pour . . . Finger-Tip Tilt Control . . . Many improved safety features . . . Push-Back Cover . . . Utmost fuel economy with either oil or gas fire . . . these furnaces will handle your melting jobs faster, better, and at great savings in costs. Capacities from No. 60 to No. 400 Crucible sizes. Bulletin No. 44 gives complete information.

STROMAN STATIONARY CRUCIBLE MELTING FURNACES

For Brass, Bronze, Aluminum and other alloys.

These furnaces sturdy, streamlined design and construction assure longest life, fastest and most efficient melting and greatest fuel economy. They are available with choice of three types of covers . . . Push-Back, Counter-Balanced and Swing (illustrated). They may be fired by Oil or Gas and are built to handle capacities ranging from No. 20 to No. 400 Crucible. Send for Bulletin No. 52 for complete information.

STROMAN FURNACE & ENGINEERING CO.

DIVISION OF

THE PETERSEN OVEN CO. 300 W. ADAMS ST. CHICAGO 6

HAUSFELD FURNACES

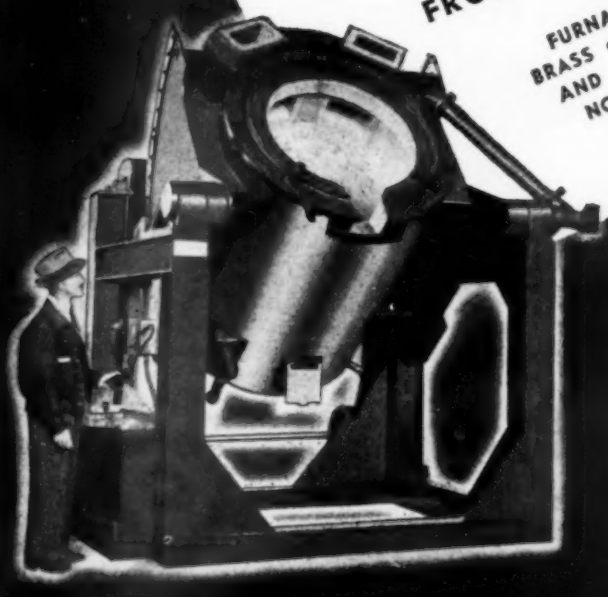
MAGNESIUM MELTING

FOR WAR AND PEACE
HAUSFELD FURNACES
SUPPLY THE DEMAND
FOR BOTH LARGE
AND SMALL UNITS
FOR OIL AND GAS FUELS

ILLUSTRATION SHOWS
1700 LB. CAPACITY
FOUR BURNER GAS FIRED
MOTORIZED
NOSE TILTING FURNACE

STATIONARY SIZES
FROM 100 LBS. UP

FURNACES FOR
BRASS • ALUMINUM
AND ALL OTHER
NON-FERROUS
ALLOYS



The Campbell-Hausfeld Co.
300-320 MOORE ST. HARRISON, OHIO

British Study Steel Foundry Practice

Opening technical session of the annual meeting of the British Iron & Steel Institute held in London on July 11-12 was devoted to consideration of some steel foundry practices.

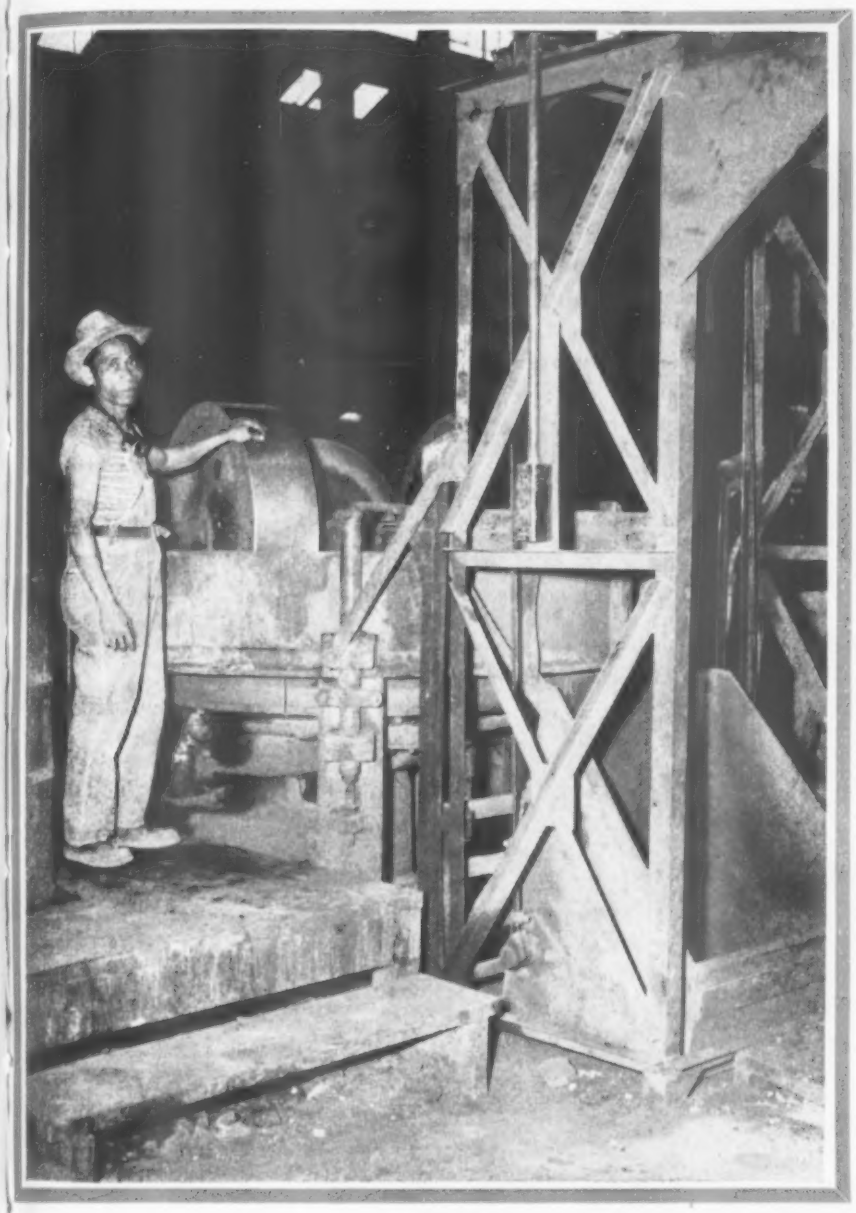
The first paper was on "The Application of Radiography to the Improvement of Foundry Technique", by Dr. R. Jackson, research department, Hadfields Ltd., Sheffield. Principles involved in the taking and interpretation of a radiograph of a casting were given and the nature and extent of the defects which were revealed were discussed. Examples were given of the application of radiography to the examination of steel castings and of the methods adopted to improve the quality of castings thus examined.

The next paper was the "First Report of the Foundry Practice Subcommittee" of the Steel Castings Research Committee. The latter is a joint committee of the Iron & Steel Institute and the British Iron & Steel Federation reporting to the Iron & Steel Industrial Research Council. The Foundry Practice Subcommittee was formed to carry out practical investigations into problems encountered in the steel foundry. The paper described results obtained from different methods of gating and risering.

Dr. L. Northcott and D. McLean, Armament Research Department, contributed a paper on "The Influence of Centrifugal Casting upon the Structure and Properties of Steel." The authors describe how thick cylinders of a Ni-Cr Mo steel were cast by the centrifugal process using chill molds rotating about a horizontal axis without a central core. The casting conditions were varied with respect to mold speed, casting temperature and rate of pouring, and each casting was examined to determine the influence of these factors upon its structure. At low mold speeds the delay in pick-up, i.e., the interval required for the metal to be rotated with the mold, resulted in the liquid tumbling about inside the mold, thus giving rise to the coarse circumferential zoning referred to as "type 1 structure", the explanation of which was confirmed by the preparation, at low mold speeds, of a series of castings in which the mold was rapidly stopped before the completion of solidification. Above these mold speeds there was an optimum range which gave a uniform structure, referred to as "type 2 structure", free from segregation. At the highest mold speed the vibration developed resulted in circumferential bands of segregate referred to as "type 3 structures", and the association of such segregation with vibration was confirmed by tests on vibrated unrotated ingots.

High casting temperatures favor the formation of the type 1 structure, reduce the type 3 banding at high mold speeds and promote the growth of large primary crystals.

Backing up the Fleet . . .



When our battle fleet pours destruction on the Jap homeland it is delivering goods made in America.

To keep it on the Mikado's doorstep requires the products of ten thousand American factories.

Directly behind the carriers and battle wagons are the U. S. Navy Yards. Today the Pearl Harbor base, expanded to ten times its prewar size, constitutes the back bone of our naval effort in the Pacific.

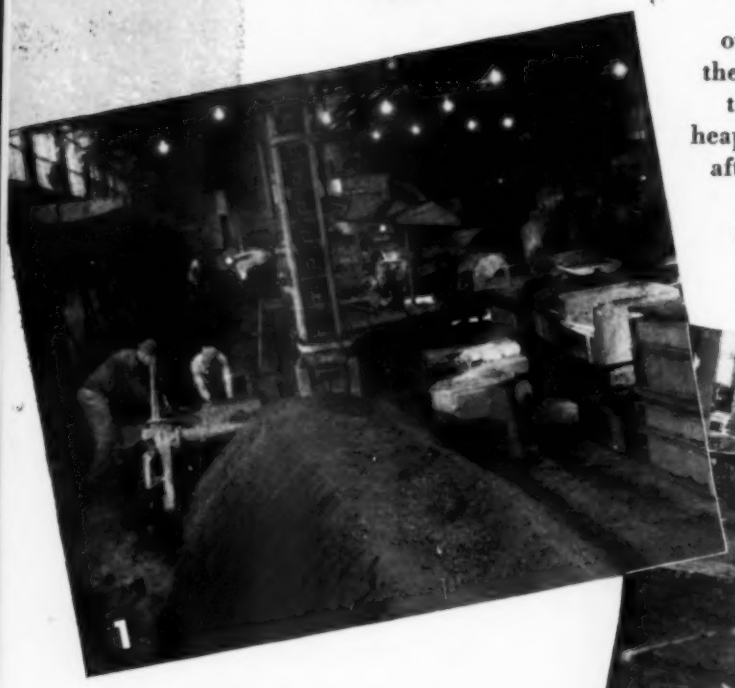
This picture shows one of the Clearfield 610 Sand Mixers in the Pearl Harbor foundry.

At the Pearl Harbor Navy Yard, as in hundreds of other foundries at home and abroad, Clearfield Mixers are helping to speed the day of unconditional surrender.

CLEARFIELD
MACHINE COMPANY
CLEARFIELD
PENNSYLVANIA, U. S. A.

"INDISPENSABLE" SAY WOODRUFF & EDWARDS OF THEIR 4 TRACTOR-TYPE SANDSLINGERS!

"Indispensable"! That's the way Woodruff & Edwards, Inc., Elgin, Illinois describe their 4 Tractor-type Sandslingers. Since they have no sand handling system, the Tractor "Slingers" are ideal for the job because they not only do an outstanding job of ramming but also prepare and riddle the sand. Each morning the day's work is rammed with the "Slingers" which move on rack tracks into the sand heap piled between the tracks . . . molds are poured in the afternoon and shaken out between the Tractor "Slinger" tracks . . . and at night the machines are reversed and they cut over the sand. The following day operations are repeated. These 4 machines have enabled W & E to prepare, handle and ram sand without investing money in a sand system!



1

2

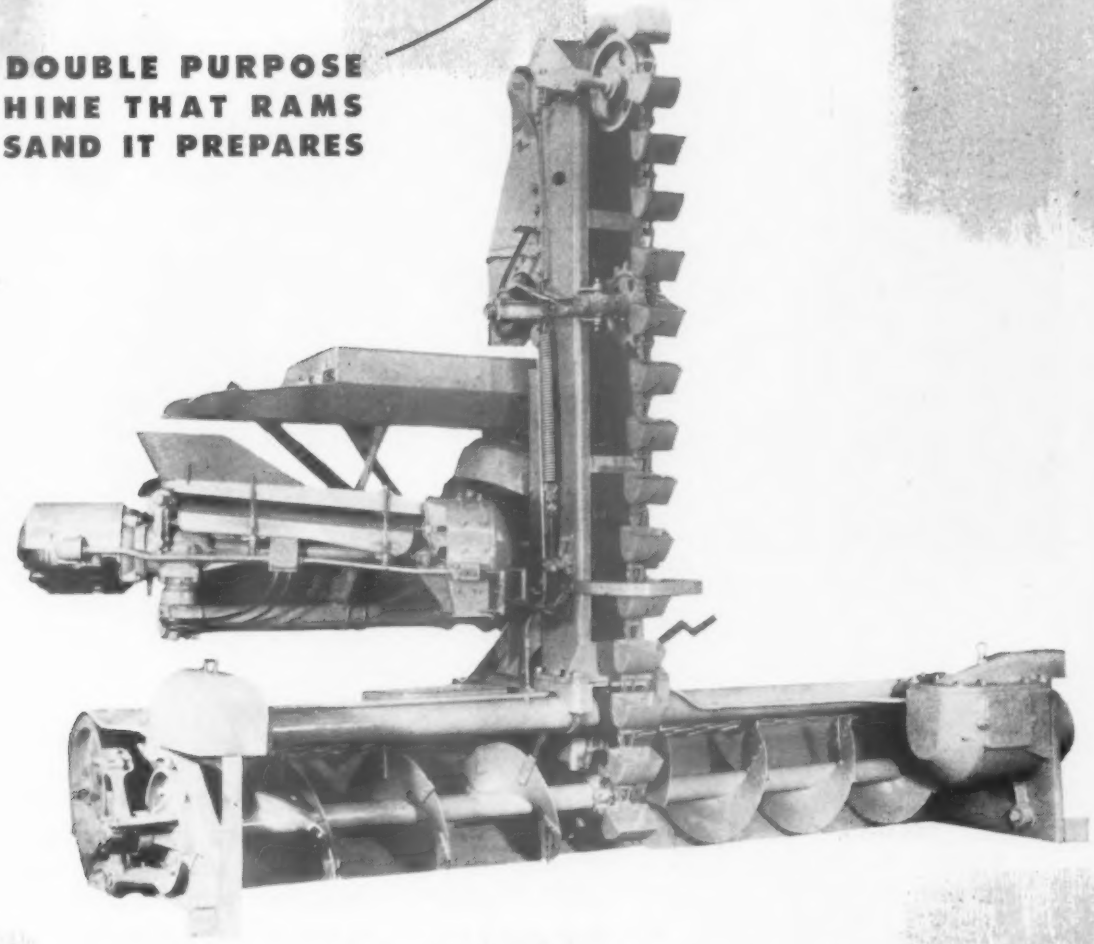
3

Many other foundries like W & E are enjoying the exceptional versatility and flexibility of the Tractor-type Sandslinger . . . the only foundry machine that can perform so many functions! Because of controlled, accurate ramming, the "Slinger" assures true-to-pattern castings and the elimination of overweight, thus reducing grinding costs. Men like to work with the "Slinger" . . . this most modern ramming method eliminates hard, laborious hand ramming . . . does a faster, better job. In these days of labor shortages the Tractor-type Sandslinger is a lifesaver . . . it returns its initial investment in all-around savings in an amazingly short time!

1. One of the 4 Tractor-type "Slingers" taking its sand supply from the heap and ramming it into molds.
2. A part of the day's run for the "Slingers" at Woodruff & Edwards.
3. Mr. Edwards (right) shows visitor the quality of two bronze finished castings.

THE TRACTOR TYPE *Sandslinger*

THE DOUBLE PURPOSE MACHINE THAT RAMS THE SAND IT PREPARES



The Tractor-type Sandslinger is a "natural" for production and jobbing foundries which have no auxiliary sand handling equipment. Write for booklet giving complete data. Better still, ask to have a B & P Sales Engineer call to show you how to speed production in your foundry. And remember, no matter what your individual foundry's needs there is a size and type of "Slinger" to meet it.

For a complete and comprehensive study on the subject of ramming, ask for our monthly magazine "Better Methods" which contains the article, "What is The Best Ramming Method?" All the text material was prepared by an entirely impartial source—a thorough comparison is made of all ramming methods. It's free—no obligation incurred—write for it today!

THE BEARDSLEY & PIPER COMPANY

2540 N. Keeler Avenue Chicago 39, Illinois

THE BEARDSLEY & PIPER COMPANY ARE MANUFACTURERS OF SANDSLINGERS, SPEEDSLINGERS, SPEEDMULLORS, SCREENARATORS, MULBAROS, SHAKE-OUTS, SAND CONDITIONING MACHINES, GYRATORY SCREENS

GET THE extras WITH SAFETY GRINDING WHEELS

Many makes of wheels, as you know, do a grand grinding job with minimum grinding cost. SAFETY Grinding Wheels, of course, are in this class. But SAFETY Grinding Wheels go much further than that, and give you important extras that add to their value.

You get almost "tailor-made" wheels—specific wheels for specific jobs. Next, if you wish it, you get the benefit of the wide experience of SAFETY engineers who will gladly analyze your foundry operation, with a view to increasing output and cutting cost for the competitive era ahead.

Select the grinding job that gives you the most trouble, and ask for one of our engineers to analyze the job in relation to one of our wheels.

For more of the facts, contact our factory, or one of the offices listed below. There will be no obligations.

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MECHANIZATION OF BRITISH FOUNDRIES

(*Continued from page* 101)

increased the need for dexterity, has largely obviated the need for skill on the part of the operative. As is well known, however, it increases the demands and the ability required from the management and executive staff. The difficulty of obtaining and training suitable men to fill such posts has proved almost as great as that encountered in securing satisfactory production.

The success or failure of a completely mechanical system, assuming that it has been well and suitably planned in the first place, is largely dependent on the management. This is particularly true in British foundries where the old methods die hard and where there is a marked tendency on the part of the workers to continue to produce at the old rate, regardless of the provision of new mechanical equipment.

Experience of the operation of mechanical plants has shown that three main advantages are obtained as follows:

1. Increased production is obtainable without the need for increased floor area or labor.

2. Better working conditions can be secured for the foundry worker because operations which produce heat, dust or fumes can be isolated or confined to a relatively small section of the plant.

3. All operations can be standardized thus enabling better control to be exercised.

Long Hours Not Desirable

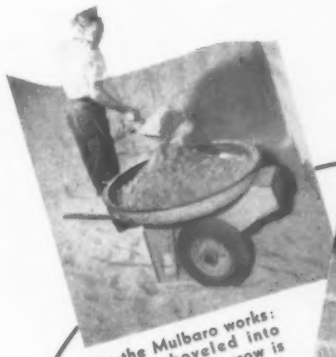
Among the lessons learned during the drive for maximum production is that no increase in output results from working an excessive number of hours per week. Hi h average production figures are more easily obtained on short shifts than when working hours are very long. The five-day week is also of real benefit in the mechanized foundry as it allows ample time for overhaul and maintenance of equipment. Maintenance is undoubtedly second only to management in its importance relative to output figures.

Relatively little progress has been made in plants engaged purely on jobbing work. The unit mechanization system previously described is suitable for adoption in plants making small and medium sized work where castings are required in sets of 20 to 50 from any particular pattern. Foundries making heavy castings in ones and twos present a problem which is little nearer solution than it was at the outbreak of war. In such shops the skill of the molder is the most important factor, and the realization of this and the use of methods which ensure that skilled men are engaged only in appropriate work has resulted in some increase in output. In some shops a central shakeout has been provided with mechanical handling of sand to the mills

MULBARO Cuts

SAND PREPARATION TIME 50%

"A 50% cut in our core sand preparation time with the Mulbaro! That's a real saving!" say officials of the Milwaukee Flush Valve Company, Milwaukee, Wisc. "What's more, the Mulbaro has paid for itself in oil savings alone in less than a year, due to more thorough, more uniform sand mulling which meets our exact molding requirements." Foundries, large and small, use the Mulbaro for facing and backing as well as core sand.



How the Mulbaro works: Sand is shoveled into barrow. Filled barrow is then wheeled into position under the mulling unit.

Mulling unit is lowered onto barrow with a hoist. Required amount of oil is added and within a few minutes, sand is completely mulled.

Mulled sand is now moved away to molding machines; another barrow of sand is placed under mulling unit.

ONLY $895*

*Entire Mulbaro unit costs only $895.00 F.O.B. Chicago . . . additional barrows are $95.00 each.

Get complete engineering data and specifications on this amazing mullor . . . write today!

THE BEARDSLEY & PIPER CO.

2540 North Keeler Avenue Chicago 39, Illinois

Manufacturers of Speedslingers, Speedmullors, Sandslingers, Screenarators, Mulbaros, Shake-Outs, Sand Conditioning Machines

A Sure Cure...

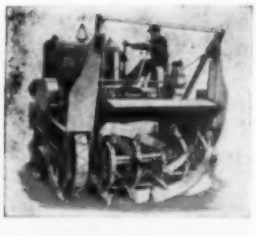
... FOR SAND CONDITIONING HEADACHES

Foundry sand conditioning can cause many headaches—if you are still doing the work by the slow and costly "man and shovel" method. And current manpower shortages have made this practice more of a problem than ever.

An American Sandcutter is a simple, sure cure for such headaches. Take the case of Castings Service Corporation of LaPorte, Indiana, for example. Unable to find experienced men to cut their sand, work piled up, costs sky-rocketed and war-vital production slumped. Even with 15 part-time laborers, toiling on 4-hour shifts with the regular night crew, the condition was aggravated, because the inexperienced help could not prepare the sand properly. Then a Model AA Sandcutter was installed. Now, one man in 2 to 3 hours cuts more than 30 floors, which formerly required over sixty hours of labor nightly! Furthermore, cutting through each square foot of sand 100 times to the man with the shovel's six, the Sandcutter leaves the sand soft, fluffy, smooth-textured and cool. Thus it riddles fast, rams easily and vents perfectly.

Don't let outmoded sand cutting methods rob you of production efficiency. Take a tip from Castings Service and the other 1500 users and install a Sandcutter.

Write for full information today.



THERE'S AN AMERICAN SANDCUTTER FOR EVERY NEED

The Model K Sandcutter shown at the left is the largest model built. Three other models—for use on floors ranging from light to heavy—make a Sandcutter available for your every need.

American Sandcutter

FOUNDRY EQUIPMENT CO.

505 S. BYRKIT STREET, MISHAWAKA, INDIANA

and automatic discharge into containers for distribution to the molders.

In many cases, overhead traveling cranes have been utilized for handling the sand between a central preparation plant and the molders. This not only helps to keep the shop clear of sand heaps, and thus give more space for production, but it also makes available a more uniform sand. Although difficulties sometimes arise in overcoming the prejudice of the molders who prefer an individually prepared sand, it has been proved that a centrally controlled sand preparation plant is a necessity in the production of castings of uniform quality.

Although considerable advances have been made in the mechanical cleaning of castings, the fettling shop is still a bottleneck in many foundries. Airless centrifugal shotblast equipment of the rotary table and barrel type are widely used, some of these operating automatically. Much interest has been created by the introduction of the hydroblast system of cleaning and this appears to be the ideal for heavy castings. The size of the plant and the costs of installation, however, place it out of reach of the smaller foundries.

There is no doubt that serious attention will have to be given to fettling shop practice, not only with regard to reducing the manual operations necessary, but also in improving working conditions as a whole with particular reference to ventilation. The improvement of these conditions will necessitate the provision of plant suitable for the smaller foundries. Although excellent dust exhausting systems have been developed, it does appear that wet methods are likely to give the most satisfactory results.

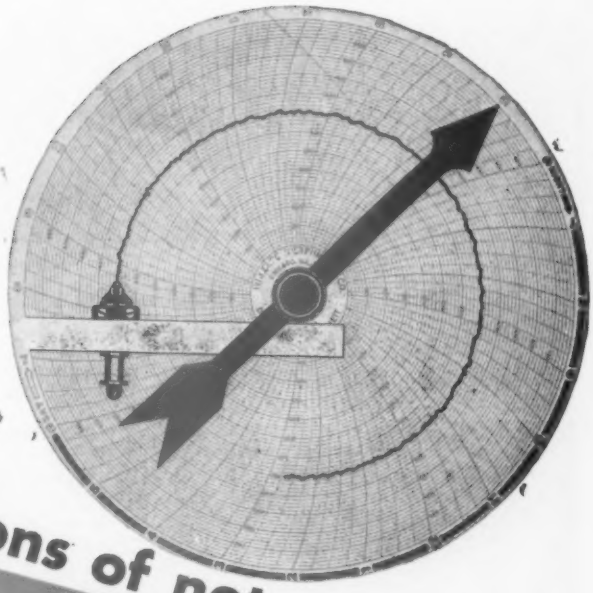
Set High Standards

The inspection and testing requirements on munitions components have generally been higher than normally called for on castings. Not only have castings been needed to extremely close dimensional limits, but increased attention has been paid to surface finish and soundness as well as to mechanical properties and composition. This has led to a general improvement in inspection and technical control and the advantages of such control have become more generally recognized. Experience gained in this direction if continued, will be of great benefit to the industry when a return is made to peacetime production.

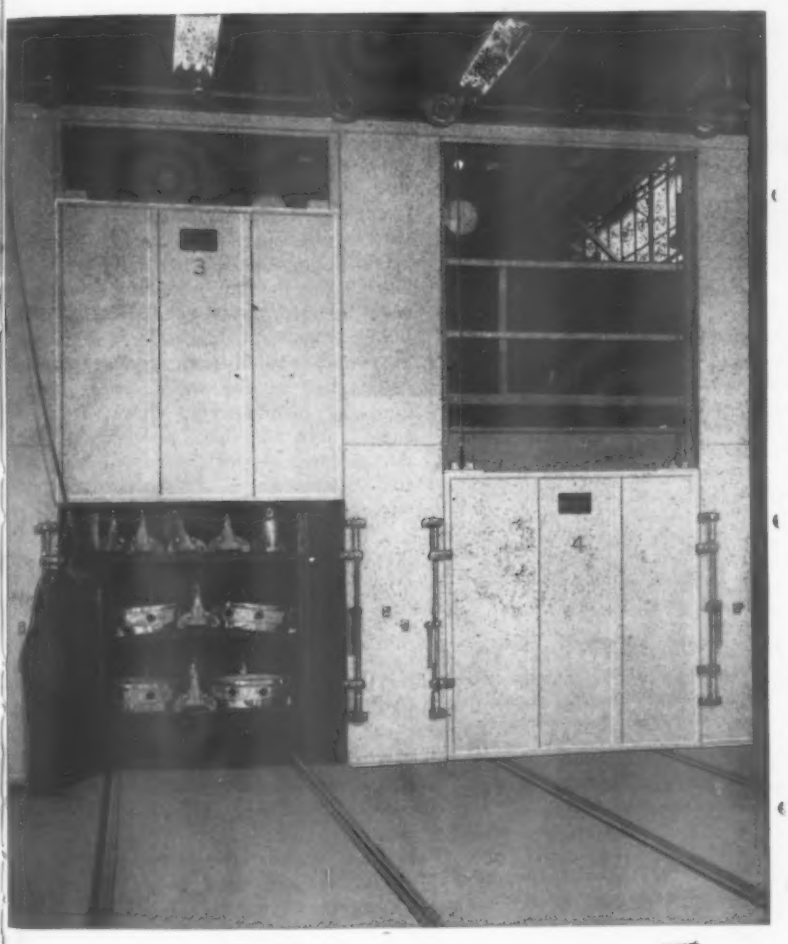
The greatest problem facing the industry at the present time is shortage of suitable labor. It appears highly probable that this will continue in a more or less acute degree for a time. The installation of mechanical production aids is therefore desirable not only because by this means labor requirements can be reduced, but also a type of labor can then be employed which would not otherwise be suitable. During the war considerable advances have been made in welfare facilities and in the appointment of personnel managers. Such executives have not under present conditions had much scope in the selection of personnel

(*Concluded on page* 194)

CHART SHOWS temperature variations of not over 5° F.



For aging, annealing, bluing, drawing, tempering, normalizing—Maehler recirculating air heat furnaces are providing heat uniformity that is VIRTUALLY PERFECT. These units are the last word in efficient, low cost operation and are solving many of today's heat treating problems.



An example of how Maehler furnaces are being used for heat treating of magnesium is shown in the photo at the left. These Maehler recirculating air heat furnaces are two of the 46 Maehler units at the Howard Foundries in Chicago. The furnace to the right in the picture is used for aging magnesium castings at 350° F. Full capacity in this furnace is 4000 lbs. From a cold start it requires about one hour for ovens to reach the 350° temperature. The castings are aged for 16 hours. The furnace at the left is used for normalizing magnesium castings. This operation requires 6 hours at 450° F. Furnaces operate independently and are gas fired. Recent reports indicate that during both of these operations temperature chart variations of not over 5° F. are maintained.

Bring your heat treating problems to Maehler—you can do the job better, faster and at lower cost with Maehler furnaces—oil fired, gas fired or electrically heated units available for handling temperatures up to 1300° F. Call a Maehler engineer today or write for latest bulletins.

THE PAUL MAEHLER COMPANY
2200 W. Lake Street Chicago 12, Illinois

MAEHLER

Industrial Ovens and Furnaces for Normalizing, Stress-relieving, Bluing, Aging, Tempering, Annealing, Drawing, Etc.

CHICAGO TRAMRAIL

JIB CRANES

SPEED

POINT-OF-OPERATION JOBS

YOU SAVE . . . 1. MANPOWER 2. INSTALLATION COSTS 3. COMPENSATION COSTS 4. PRODUCTION COSTS 5. MAN-HOURS

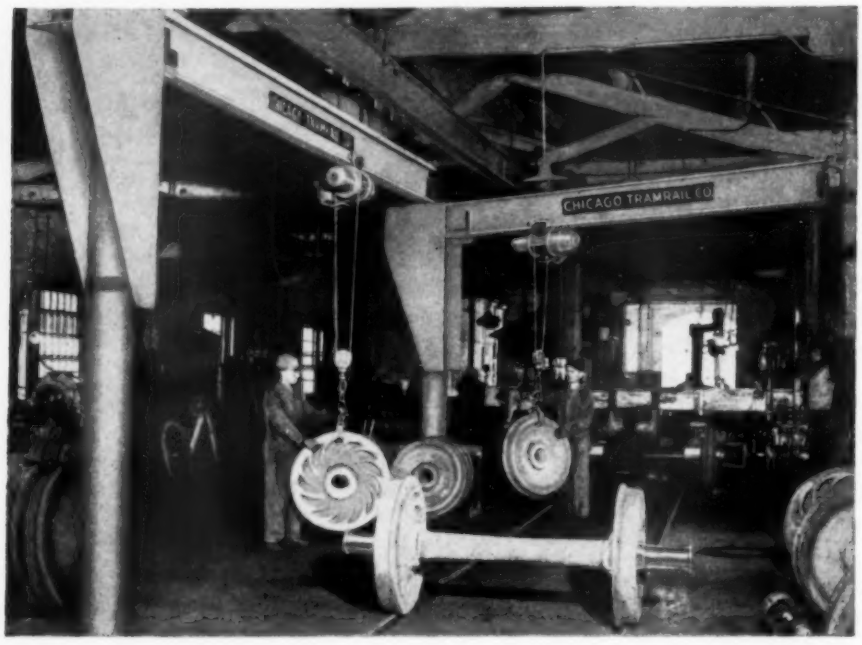
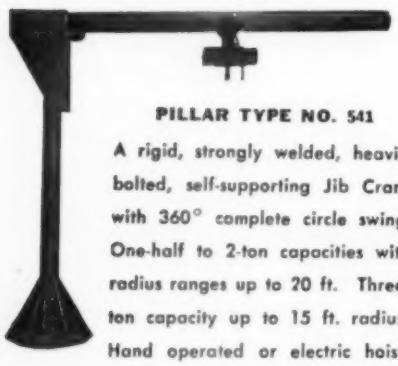


Photo courtesy of Union Pacific Railroad

The assembly of railroad wheel-and-axle units is a job that calls for precise coordination in heavy handling. Too light a job for costly overhead cranes, and too dangerous for all but the most skilled manual labor, it is an ideal application for fast-action, flexible Jib Cranes. Working in conjunction, the two nimble Jib Cranes ease the wheels into place on the axle swiftly and surely, without danger to the delicate bearing surfaces of the axle or journal. This used to be a job for skilled workmen, but now easy-to-operate Jib Cranes take over the difficult task—a real help in these labor-scarce times.

Jib Cranes help to reduce compensation costs because they lessen the probability of accidents that are so frequent in heavy handling. For example; the operation above was formerly a dangerous one. Many strains and broken bones resulted from rolling the heavy wheels into position, but now the men have only to guide the free-swinging Jib Cranes as they swing around, pick up the wheel and carry it to the point of assembly.



PILLAR TYPE NO. 541

A rigid, strongly welded, heavily bolted, self-supporting Jib Crane with 360° complete circle swing. One-half to 2-ton capacities with radius ranges up to 20 ft. Three-ton capacity up to 15 ft. radius. Hand operated or electric hoist.

IN *YOUR* PLANT

It's easy to see how swiftly, economically and safely Jib Cranes perform the operation illustrated. You can effect these same savings in your plant through the use of Jib Cranes. Look around your plant—you're sure to see many places where the use of these sturdy "mechanical muscles" will save you time and money as well as speed up production. Write for full particulars today. We will be glad to send you an illustrated circular showing the various types of Chicago Tramrail Jib Cranes together with many suggested applications for their use.

WRITE TODAY!

CHICAGO TRAMRAIL COMPANY

2910 CARROLL AVE. Phone KEDzie 7475 CHICAGO, ILL.

(*Continued from page 192*)

but this should be considered a matter of great importance for the future. As much care should be taken in choosing suitable workers as is given to the selection of plant.

The immediate future is by no means clear and in designing new plants for postwar production it will be necessary to strike a balance between under and over mechanization. Under mechanization results in time and thought being wasted in efforts to perform more cheaply by hand, operations which could be done mechanically. There is still a possibility, however, that after the war labor will again be available, and in this case plants which are too highly mechanized will find themselves at a disadvantage with regard to overhead and maintenance charges. A point to be considered in this connection is the high cost of electric current, and its variable cost throughout the country, which makes the conservation of horsepower a major consideration even to the detriment of production capacity. This variation in power costs in different areas has an inhibiting effect on industry in the same way that fluctuations in currency values have on overseas marketing.

How To Start Your Own Business

Establishing and Operating a Metal Working Shop, a 200 page book 6 x 9 inches, is the first in a series prepared by the Bureau of Foreign and Domestic Commerce for the guidance of veterans, war workers and others who plan to establish enterprises of their own. To answer the evident need for sound and practical information special booklets are being prepared. Subjects will include mechanical, retail and service trades.

The first of the series covers several kinds of metalworking shops. It is assumed here and in all succeeding books on business requiring mechanical skill that the reader is a thoroughly experienced operator. The mechanical side of the business is not covered except as it pertains to management. Records over a long period of years indicate clearly that lack of experience and management know-how is the principal cause of business failure.

The present manual covers general repair and service shops, welding shops, sheet metal working shops, ornamental iron works, combination shops and mobile shops. All factors connected with the establishment and operation of a metal working shop are discussed; choice of location, capital investment, organization of the business, building and layout, getting business, unusual sources of business, credits and collections, record keeping, etc. Pitfalls to be guarded against are indicated.

Copies of the manual may be obtained from the superintendent of documents, U. S. Government Printing Office, Washington 25, or from any of the field offices of the department of commerce at 35 cents each.

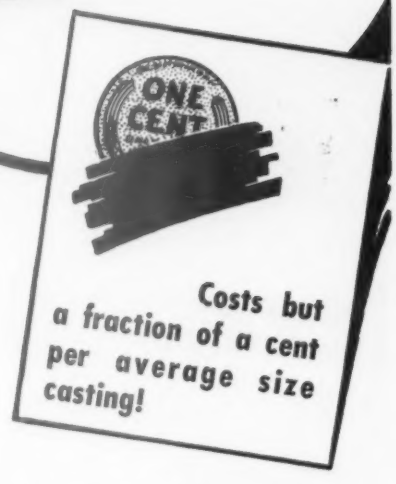
Make Better Castings DOUBLY SURE!

Use Famous CORNELL CUPOLA FLUX

As the foundry industry turns to peace-time production and business depends solely on quality of product and dependable deliveries, you cannot afford to take chances on delays and increased costs through make-overs. Make good, sound castings the very first time, day after day, by using a few cents worth of Famous Cornell Flux in every cupola charge.

The result is shortened heats, iron comes clean and more fluid, resulting in denser grained, stronger, cleaner and more easily machinable castings.

Famous Cornell Flux keeps cupolas clean. The flux glazing over the lining prolongs life of brick in melting zone, gives cupola a clean drop, and reduces maintenance.



Costs but a fraction of a cent per average size casting!

Famous Cornell Cupola Flux in its EXCLUSIVE SCORED BRICK FORM has these added advantages:

Takes only a few seconds to use, saving time and labor.

Promotes accurate measurement — correct quantity of flux per charge. You simply toss in one brick to each ton or break off a briquette (quarter section) for each 500 pound charge of iron in the cupola.

None of Famous Cornell Cupola Flux blows out with the blast. Being in brick form, it stays in melting zone until entirely consumed.

Write for Bulletin

The CLEVELAND FLUX Company

1026-1036 MAIN AVENUE, N. W., CLEVELAND 13, OHIO

Manufacturers of Iron, Brass and Aluminum Fluxes, Since 1918

FAMOUS CORNELL FLUXES Trade Mark Registered

Write for Bulletins

Famous CORNELL ALUMINUM FLUX

Produces clean, tough castings. No spongy or porous spots even when more scrap is used. Thinner yet stronger sections are poured. Castings take a higher polish. NO FUMES! Exclusive formula prevents obnoxious gases. Metal does not cling to dross.

Famous CORNELL BRASS FLUX

Makes metal pure and clean, even when dirtiest brass turnings or sweepings are used. Produces castings which withstand high pressure tests and take a beautiful finish. Saves considerable tin and other expensive metals. Crucible and furnace linings are preserved.

Famous CORNELL LADLE FLUX

Place a few ounces in bottom of ladle, then tap cupola. Metal is thoroughly cleansed, foreign impurities are easily skimmed off. Ladles are kept clean, there is less patching and increased ladle life. Metal temperatures are retained during transfer to molds.

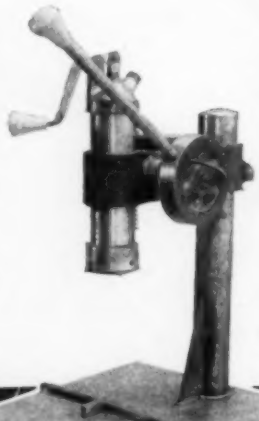
NEW and UNIQUE! » THE CARTRIDGE BENCH CORE BLOWER

*Users report remarkable increases in quality and quantity of production

Produces variety of intricate cores with unusual speed and simplicity.

Comes ready to use—virtually no installation cost.

Can be operated with unskilled labor—extremely easy to use.



If you make cores 2 lbs. or under—this unit ideally suited to your use.

Designed by two practical foundrymen.

WRITE for complete details and new booklet

Core boxes can be made very light, in most instances bench equipment now used can be converted for blowing. Almost any sand now commonly used on the core bench may be used for blowing cores. Adjustment for boxes of different height, size and shape made instantly.

To operate, core box and cartridge are held down by pressure handle while left hand operates blow valve. After core has been blown, the box is pulled forward and cartridge is lifted off and the work of drawing core is completed on base of machine.

FILLS NEED FOR SIMPLE, FLEXIBLE BLOWER

The New *Redford Cartridge Bench Blower* has met with enthusiastic acceptance by foundrymen because it supplies an important need in the foundry for an efficient, low-cost method of blowing small, intricate cores. It requires no large volume of air and readily lends itself to handling a variety of core boxes. In fact, they tell us that it is the ideal method of making cores in single or gang boxes requiring a maximum of 2 lbs. of sand.

SAND CARTRIDGES AVAILABLE IN 8 STANDARD SIZES

Blower comes complete, ready to use. Each blower provided with one Size "C" sand cartridge which is adaptable to a large range of core boxes. Cartridges are available in seven additional standard sizes and special sizes furnished where needed.

★ Cartridge Bench Core Blowers

Redford IRON & EQUIPMENT CO.

Phone: REdford 8610

21315 West McNichols Rd. Detroit 19, Michigan

FOUNDRY RESEARCH AT BRAKE SHOE

(*Continued from page* 97)

Molds and cores are made either by machine, or by hand at benches located along the wall of the side bay. While production requirements from a volume standpoint ordinarily do not require the output that mechanical molding provides, the use of machines is one of the various instances in which the experimental foundry is able to duplicate the operating conditions met in the company's production foundries. At the same time, the three machines used—including a large jolt rollover unit—simplify the making of the heavier cores and molds.

Synthetic mixtures are employed for molding sand, which is prepared in the 1000-lb capacity mixer shown in Fig. 9. This mill is equipped with vibrating screen and magnetic pulley for reclaiming used sand recovered from the shakeout. The mixer is elevated on pedestals so that the prepared batch can be conveniently dumped into a tote box mounted on skids for transfer by lift truck to the molding stations.

Some Molds Skin Dried

When dried sand molds are required, an oil fired unit is available for skin drying, while cores are baked in a rack type recirculating oven. Molds for static castings are set out on roller conveyors for pouring, and after cooling, both this type and centrifugal castings are transferred to the shakeout. A tumbling mill is used to clean smaller castings, while larger castings are blasted in the room shown in Fig. 8. Heat treating facilities and the inspection department occupy the far end of the foundry. The former include two electric furnaces—a heavy car type unit providing temperatures up to 2300 F, and a circular pit furnace 4 ft in diameter and 6 ft deep for treating up to 1450 F. Oil and water quench tanks are adjacent to the furnaces.

Adequate facilities, including a 200-kv x-ray machine and a magnaflux unit, are provided for various kinds of tests on castings. The physical testing laboratory and sand laboratory, located between the foundry proper and the main section of the metallurgical laboratory, are well equipped for their particular work. Activities of the sand laboratory involve research and control work for foundries of the company's different divisions.

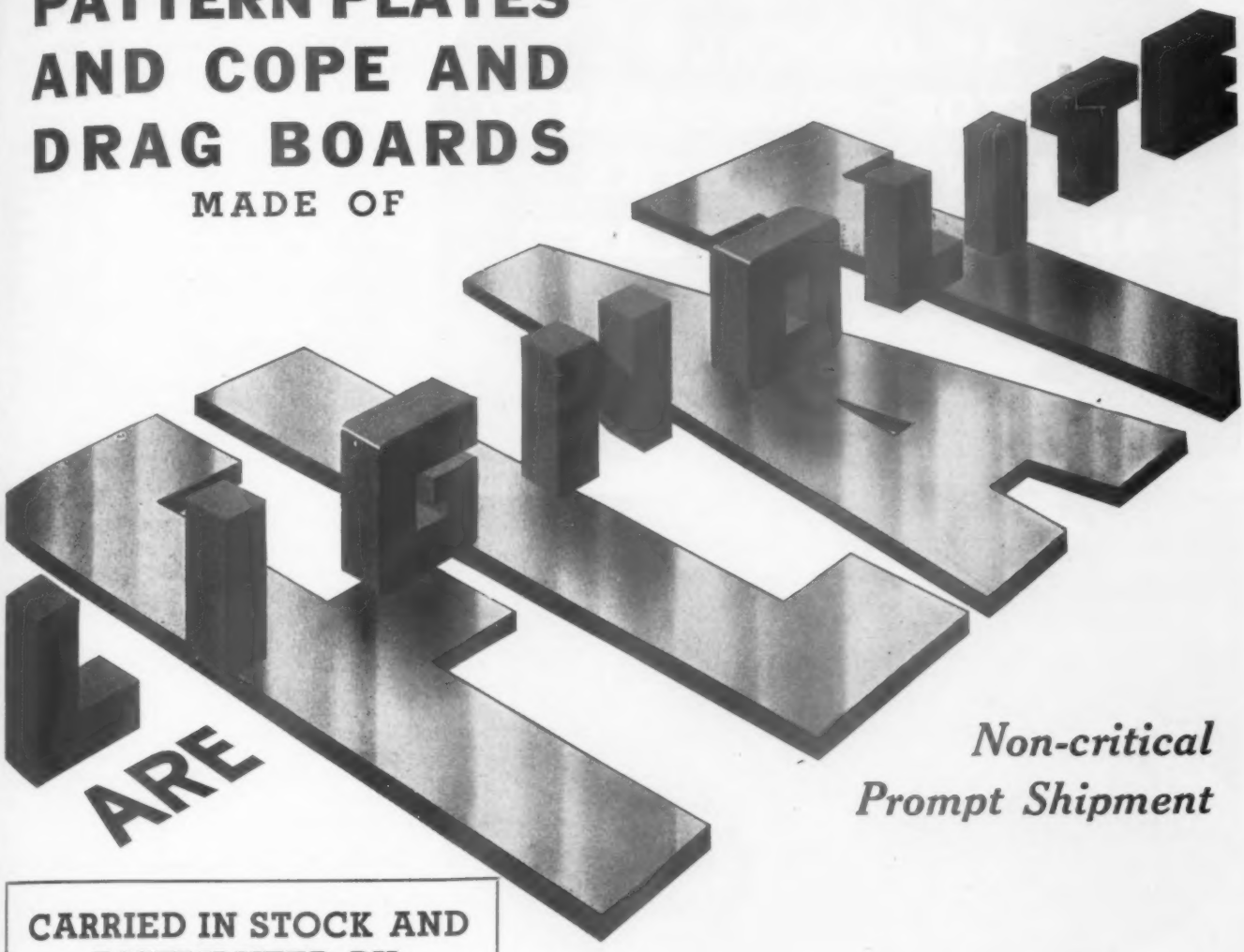
For some time the company has been developing procedures for the production of precision castings by the investment, or lost wax, process. This work is carried on in a separate department of the metallurgical laboratory, as shown in Fig. 6.

At present, work of the metallurgical laboratory and experimental foundry is

(*Concluded on page* 198)

PATTERN PLATES AND COPE AND DRAG BOARDS

MADE OF



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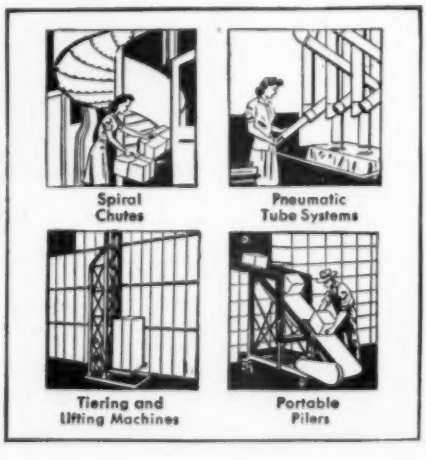


(*Concluded from page* 196)

carried on by a staff of approximately 65 persons under the direction of Earnshaw Cook, chief metallurgist, who has held that post since 1939. Mr. Cook went with Brake Shoe as research metallurgist in 1933, following 11 years in metallurgical work with Bethlehem Steel Co. Raymond H. Schaefer, assistant chief metallurgist, heads the experimental foundry under Mr. Cook. Mr. Schaefer joined the company in 1940 after nearly 6 years with the research laboratory of International Nickel Co. Serving first with the American Manganese Steel Division as assistant foundry metallurgist and later as general foundry superintendent, he was made assistant chief metallurgist of American Brake Shoe Co. in 1943.

Research activities at Mahwah have provided a number of papers on metallurgical subjects in recent years. The Henry Marion Howe medal of the American Society for Metals was awarded in 1944 to R. A. Flinn, Earnshaw Cook and J. A. Fellows for their paper on "A Quantitative Study of Austenite Transformation." Studies of heat resistant alloys, which have been under investigation for some time and which still are an important research subject at Mahwah, have been the subject for several reports, including "Engineering Properties of Heat-Resistant Alloys," (AIME Technical Publication No. 1480) by Howard S. Avery, Earnshaw Cook and J. A. Fellows.

To Aid Personnel Training

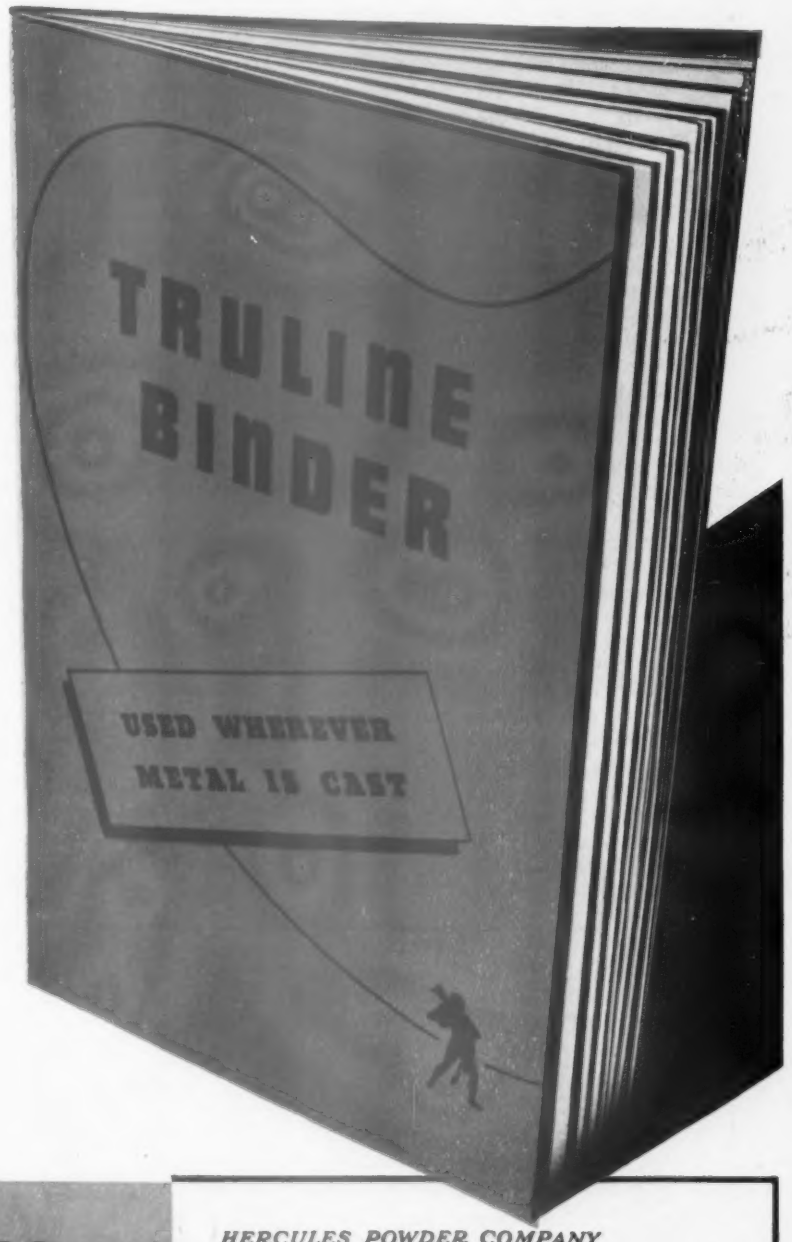
While, as indicated previously, research relating to war requirements had the No. 1 call on the experimental foundry for the duration, many projects having postwar application are planned. A considerable portion of the future work will be to seek improvement in the company's present products by changes in foundry practices, melting techniques, and rigging.

One of the most important roles to be filled by the experimental foundry in the days ahead will be in personnel training. It is planned to put apprentices through an intensive training period in the foundry and then release them as they may be needed to one of the operating divisions. Another proposal for the future is to establish a group of field metallurgists to work in conjunction with the experimental foundry. These men will assist in developing new markets and new products through a correlation of laboratory efforts with industrial needs.

Last, but not least, this modern example of foundry research should have a certain value to the industry as a whole in stimulating like work elsewhere. To quote *Brake Shoe News*, a company publication, "the foundry is intended to be a changing, modern exhibit of good foundry practices. Interested visitors will be welcomed after the war—metallurgists, research specialists, engineers, operating men, in fact anyone who thinks he may benefit by visiting the foundry."

This handbook can help you get better castings at lower cost!

New 32-page booklet tells how Truline* Binder gives faster, uniform baking—cuts casting cleaning time—reduces rejects



Here is a book you can use as a guide to better castings at lower cost. The information in its thirty-two pages is based on Hercules research into sand and binders, its work in foundry core-rooms, and the findings of hundreds of Truline Binder users.

The first eleven pages describe in detail the general properties and advantages of Truline Binder. The following twelve pages give procedures for its use in many types of cores and mixes for steel castings. Final chapters give recommended core mixes for gray iron, malleable iron, and brass castings.

Send for this booklet today. Coupon brings your copy by return mail. Please check where indicated if you desire a free 5-pound sample of Truline Binder for testing.

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NB-53

The adventures of BILL

BY PAT DWYER
Drawings By RICHEY

ABOUT 8 bells, which by a singular coincidence also means 8 o'clock p.m. eastern war time in this particular zone of operation, Bill glided into the fairway, backed his fore topsail, lowered the jib, clewed up his main sail and royals, let go his anchor and slowly swung into position with his bow pointing into the eye of a gentle breeze from the sou'sou' west. All of which translated into ordinary land lubber language means that the sturdy citizen flopped into a long chair on the veranda usually reserved for stray or transient visitors.

The foregoing nautical reference was prompted by the fact that at the time of Bill's appearance I was deeply engaged in following the adventures of one Commodore Hornblower, a very salty individual indeed, afraid of nothing in the heavens above, the earth beneath or the waters under the earth. Probably and more properly speaking that should be the waters over the earth in practically all parts of the world. The doughty commodore was the personification of the spirit of the British navy at a period when naval engagements were fought hand to hand, when the grappling hooks locked the ships in a close embrace while the tanned and bearded boarders, cutlas or pike in hand swarmed over the bulwarks and slugged it out in a bloody inferno of smoke and flame and the choking, acrid smell of burning powder.

In addition to brewing an elegant pot of adventure, intrigue, derringdo, high and low society, gold lace and cocked hats, and a morning bath of icy Baltic sea water from a deck pump—Could your modern hero do that?—well, anyway, the author goes into the most intimate and technical detail of handling a great 74 ship of the line under every conceivable condition of wind and weather. The book is flavored only slightly with a touch of profanity. In this respect alone the author happily and definitely has broken away from the old standard sea story formula. Also, and perhaps this is even more remarkable, from beginning to end not a single character "shivers his timbers," or misplaces the letter *h*. Bill politely intimated that I was wasting my time.

"I can't understand," said he, "how a presumably normal and sensible person can sit there like one of these here now heathen buddies, with a hunk of a book grabbed in both hands, eagerly lapping up the impossible adventures of people who probably never existed. Even if the adventures were possible and the heroes actually clanked around in spurs and jack boots and dangling ear rings, they are all dead and gone and who cares who they were or what they did? You laugh at the stories told to innocent, confiding and therefore helpless children, and yet you voluntarily stuff yourself, or stuff what you are pleased to call your mind with a mess of junk, the idle meanderings of authors who have no better foundations for their subjects than the authors of *Jack and The Beanstalk, Snow White and the Seven Dwarfs*, or *Humpy Dumpy* had for their efforts."

"To give that noble burst of eloquence its true value." I interrupted admiringly, "you should have stood up, crossed your arms in the approximate position of the wishbone, twisted your face into a little more repulsive form than usual, showed all your teeth and snarled, 'I have spoken.' Evidently you never have perused the voluminous works of the late J. Fennimore Cooper and other more or less inspired writers who built up quite a bit of a reputation on their portrayal of the noble red man's speeches in war and peace. Usually at war either with his neighbors or with the white emigrants from Europe who calmly, brazenly and hypocritically walked in and stole the land openly or went through the farce of acquiring vast tracts for a jug of rum, a half dozen cast iron hatchets and a 5 cent bag of colored glass beads."

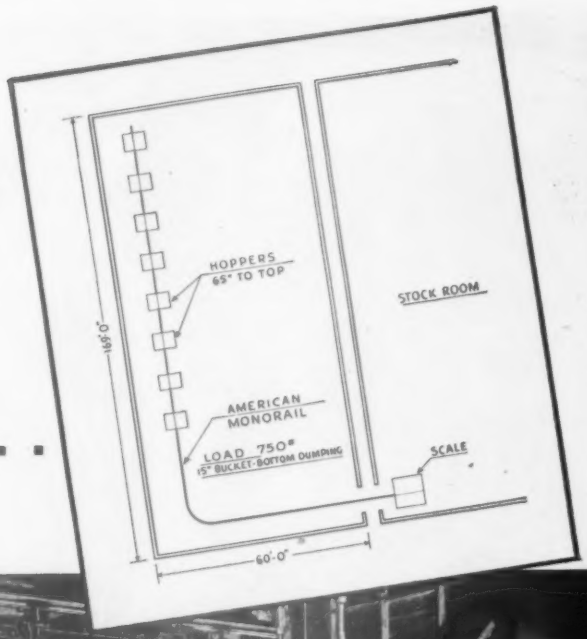
"You can't pin anything like that on me," Bill declared virtuously. "When my people came here some person or persons already owned all the land. An outsider had as much chance of grabbing a few square feet as you would have today if you attempted to put up a modest igloo in the Public Square. I am happy to say I never was tempted, but young men who served their time with me, had to pinch the pennies for several years before they could make a down payment on a stony lot 24 x 50 feet out on the ragged edge of the town, and covered with little spruce trees, blueberry bushes, burdocks, thistles and poison ivy. I remember one lad—"

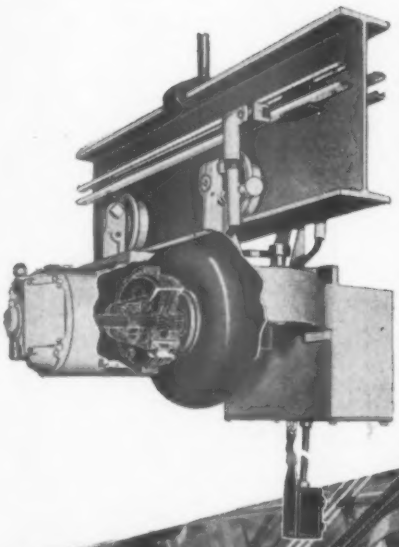
"I know," I said, "I know. He never

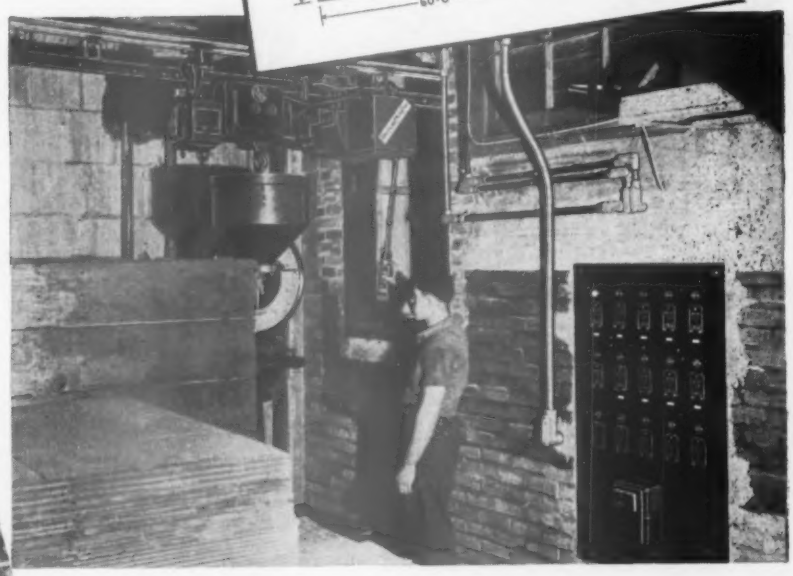
(*Continued on page* 202)

Without violating any confidence, one might say, might one not, that the reader is not enjoying the article

American MonoTractor *Automatically* Feeds 15 Stations . . . . .







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After dispatcher fills container with slugs he carefully check-weighs the load and dispatches it to one of the 15 machines. Operator at machine where carrier stops automatically unloads the metal slugs by push-button control and returns carrier to central station. All handling operations are performed through signal lights and push-button switches. American MonoRail Systems are not all so complicated. But all do the handling job for which they are designed — better, quicker and at great saving in cost. An American MonoRail engineer will gladly tell you how it will work in your plant.

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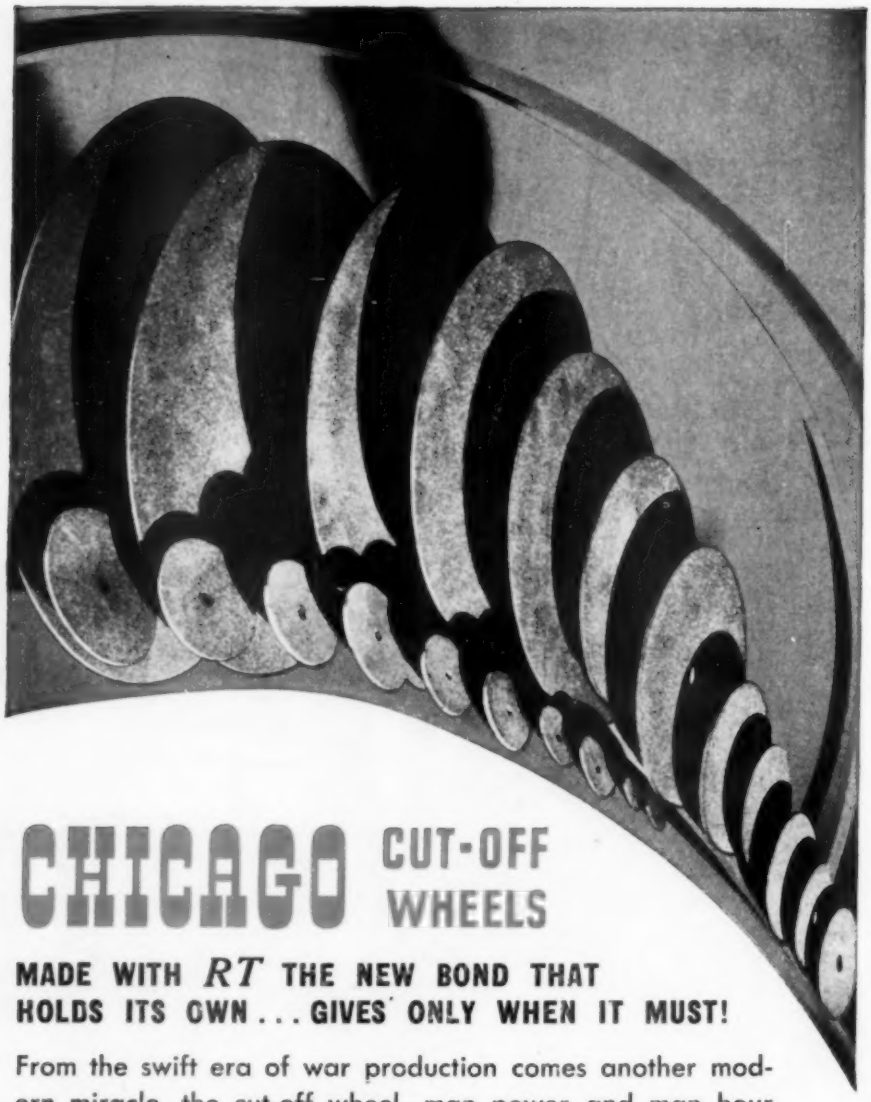

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(*Continued from page 200*)

earned over $2 a day. He worked in the same shop for 40 years. He bought a lot and built a house and raised a family of 10 children and sent two through college. However, it seems to me we have dragged our anchor and drifted a long way out to sea. In your totally uncalled for and mistaken criticism of my habit of reading a book, you overlook the important and well known fact that reading makes a full man. Have you never heard or read that any man can acquire a liberal education if he devotes only one hour per day to reading?"

"Not the kind of reading you do. You skim through a book in a few hours and you would not be a full man if you kept on absorbing that kind of froth for 1000 years. Talking about well known statements, you might ponder for a moment on the favorite old time

Navy had wooden ships and iron men

expression of contempt for any person whose opinion did not coincide with our own. ' O for the luvamike," says the party of the first part to the party of the second part, 'shut your crooked trap. You are like a barber's cat, full of wind and soap bubbles!' Nothing personal intended y'understand, but I read an article the other day in a magazine that forcibly brought the bon mot to mind."

"I thought you did not waste your time reading books and magazines?"

"Well," said Bill, "I'll tell you. I was kind of forced into this thing when I entered the one man barber shop where I go for a bit of clip every now and again. With three other hairy customers ahead of me I realized I was going to be stuck for an hour before my number came up, Mental statistics compiled over a period of many years in all kind of barber shops indicated that a victim is put through the chair at an average speed of 20 minutes. Of course,"—with assumed carelessness and a shifty glance in my direction—"the barber lad can

(*Continued on page 204*)

Carl-Mayer CORE AND MOLD OVENS

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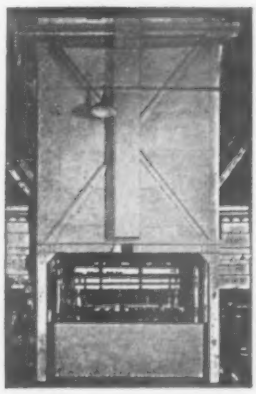
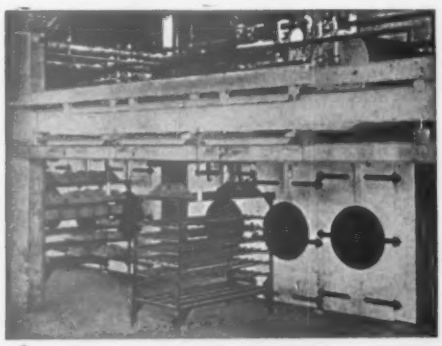
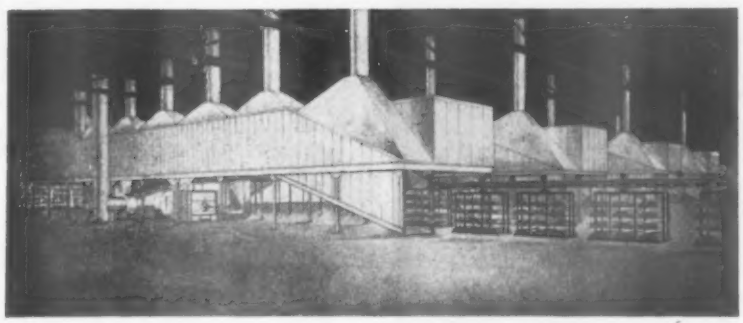
Three Outstanding Carl Mayer Vertical Ovens at General Steel Castings Corp. Each oven 67' high, 80 tons per bake, per oven.



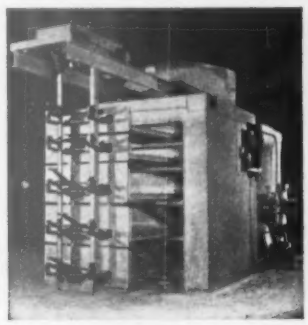
Typical Carl Mayer Vertical Core Oven as installed at outstanding foundries.



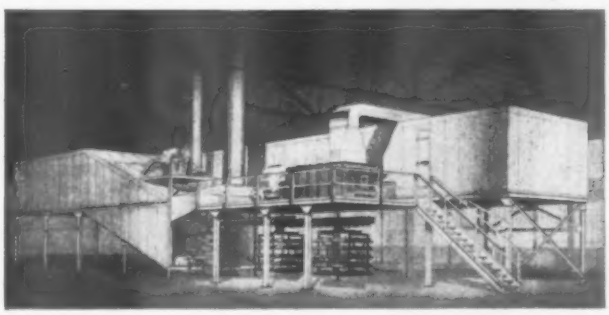
Part of large Carl Mayer Recirculating Gas Fired Rack Type Oven installation at The General Electric Co.



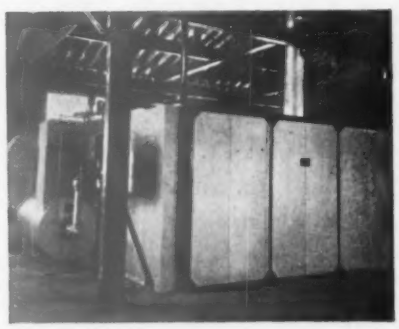
Four of the largest Continuous Monorail Core Ovens in U.S.A. for Ford Motor Co. each 170' long.



Rolling Drawer Oven Recirculating type. Fired with any fuel.



Third Continuous Monorail Core Oven for Eclipse Aviation, Bendix Aviation Corp. 27' wide, 78' long, load capacity of 10½ tons per bake.



Car Type Mold or Core Oven with lift door as installed at Ford Motor, General Steel Castings, U. S. Steel Corp.

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(*Continued from page* 202)

skate over and mow the scanty crop in the more or less barren areas in less time, but on the other hand where the going is heavy in a bushy top heavily impregnated with axle grease or some equally repellant form of googum, the work is slowed down to some extent. However, as I said before, the average remains at 20 minutes.

"Try your hand at figuring it out some time. Maybe you would get enough dope to write a learned monograph on the subject of human hair, where does it come from, what makes it grow, what makes it fall out, and most mysterious feature of all, what does the barber do with each day's accumulation? Have you ever considered the idea of taking a gander through this highly interesting field?"

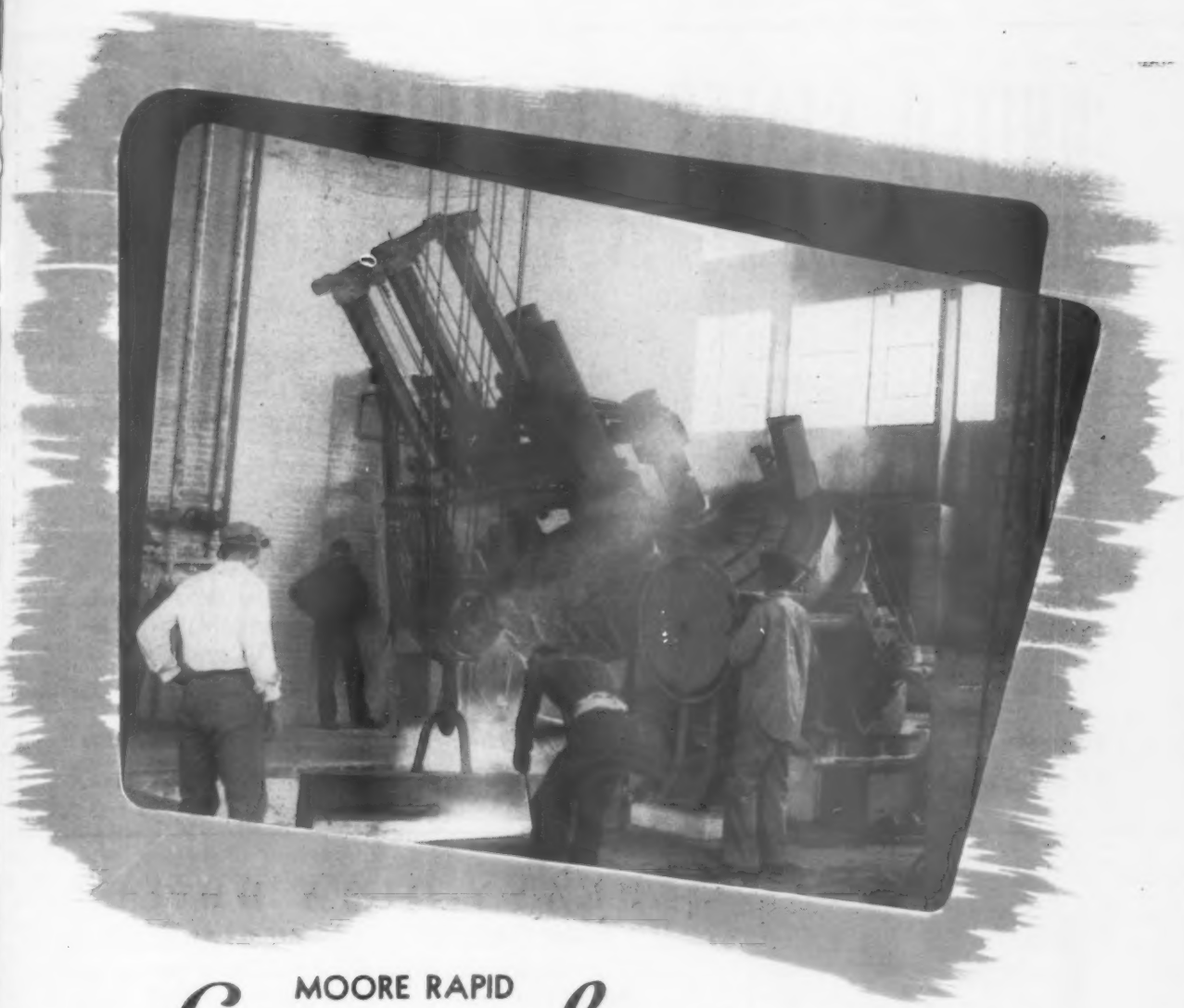
"Have you ever considered the advisability of staying on the main highway? Would it be too much of a strain on your mental apparatus to go back to the barber shop where you tried to pick up a little information by sticking your long beak in a magazine."

"You would be amazed at all the information I picked up. With an hour of idleness on my hands I picked up this here now magazine intending just to flutter through the pages and maybe look at the pictures. The pictures were few and far between, depicting stalwart young men, all knobs and muscles. The accompanying text, usually a brief and modest biographical sketch, indicated that as a youth the writer was so thin and scrawny he was afraid to go outside on a windy day. Rude companions claimed that if he drank a bottle of pink lemonade, he could hire himself out for a thermometer. He was ashamed to appear near a swimming pool or bathing beach, and between one thing and another he was beginning to wonder whether it was worth his while to hang on any longer to the string of life. Then one day he came across a copy of the famous magazine. He read of cases far more deplorable than his. Reading avidly, almost like a hound dog with his nose on the trail, he discovered to his amazement that invariably each of the derelicts by going practically naked and living on a scanty diet, developed a physique combining all the more extraordinary attributes of Samson, Hercules, Atlas, Tarzan, Superman, Goliath of Gath and Abdul the Bul-Bul Ameer. A detailed description of his daily program, deep breathing, chinning himself with one hand, bending steel rails, a 5 mile trot in his bare feet morning and night, an hour with the punching bag and another hour devoted to lifting huge weights over his head, left me wondering where or how he found time to earn a living."

"Maybe," I said, "he worked in a war plant at night building widdlewaddles that enable certain fortunate people to make long cross country trips on an *A* coupon."

"I wish I knew the location of that

(*Continued on page* 207)



MOORE RAPID

Lectromelt

FURNACES

For the efficient melting of plain carbon and alloy steels for ingots and castings and gray and malleable irons. The top charge feature of Lectromelt Furnaces offers many advantages such as greater output due to decreased charging time, lower power and refractory costs, increased production per man hour, etc. Especially large pieces of scrap can be charged readily, and light fluffy scrap can be charged to shell height with a drop bottom bucket.

Write for catalog. Ask for any desired assistance.

Lectromelt Size PT

(a) Usual acid steel hourly rating	3 tons
(b) Usual size of heat	9000 to 12000 lbs.
(c) Has poured in one heat	25000 lbs.
(d) Usual single turn foundry output	24 to 28 tons
(e) Usual KVA rating	2000 to 2500
(f) Shipping weight—furnace with its electric substation and control equipment (approximately)	50 tons
(g) Shipping weight—2 linings and 50 electrodes (approximately)	42 tons
(h) Volume data	(f) 2800 cu. ft. (g) 1100 cu. ft.

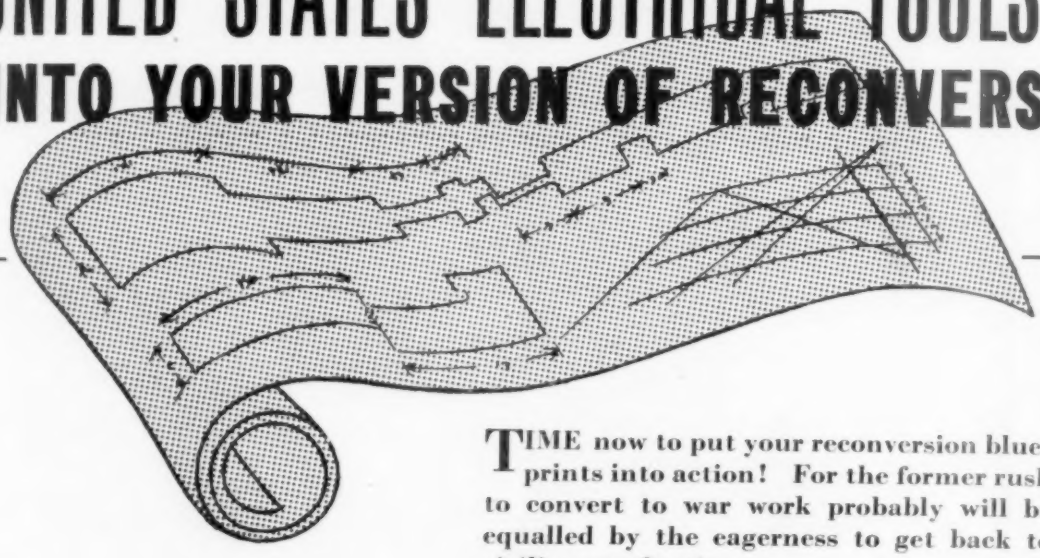
This size PT Lectromelt Furnace is one of the most popular sizes for foundries and smaller ingot shops. Other sizes range from 100 tons down to 250 lbs.

PITTSBURGH LECTROMELT FURNACE CORPORATION

PITTSBURGH 30, PENNSYLVANIA

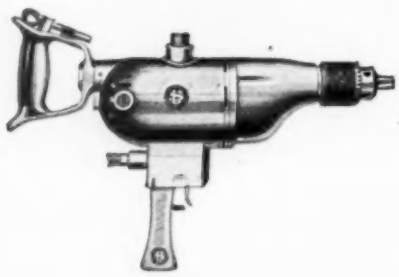
UNITED STATES ELECTRICAL TOOLS

FIT INTO YOUR VERSION OF RECONVERSION



TIME now to put your reconversion blueprints into action! For the former rush to convert to war work probably will be equalled by the eagerness to get back to civilian production.

To make your reconversion program show up on the profit side you'll need UNITED STATES ELECTRICAL TOOLS to speed production and keep costs in line.



HEAVY DUTY DRILLS

Model 58HD 5/8" *Model 34HD 3/4"*

Super-powered, especially designed for heavy production work or maintenance. Ball bearings on armature. Chuck spindle mounted in two radial thrust ball bearings. Chrome nickel steel gears, heat treated, packed in grease and sealed. Two pole quick make and break trigger switch. Momentary switch, if desired.

MODEL 34HD CAN BE FURNISHED WITH NO. 2 OR 3 MORSE TAPER SOCKET WITHOUT ADDITIONAL CHARGE

PORTABLE ELECTRIC GRINDERS

4" to 8"—from 1/3 h.p. to 1 h.p.

For grinding, buffing, polishing, sanding down castings and other operations. For production or maintenance. Chrome nickel alloy steel gears, hardened, in greasetight case. Oversize ball bearings throughout. Universal motor.

THE United States ELECTRICAL TOOL CO.
CINCINNATI 14, OHIO

(*Continued from page 204*)

factory," Bill remarked wistfully, "I'd certainly get me one of them there widdle-waddle things. I am pretty well tired of waddling around like a lame duck. I wonder if ever again we shall sense the glory of the open road and indulge in the famous old slogan 'Fill 'er up!' I had a letter the other day from a citizen who also is doing a bit of wondering on the general subject of where do we go from here.

"'For the past 15 years,' he writes, 'we have been using gray iron castings for a line of special devices we manufacture. We have been depending entirely on a local foundry as a source of supply. During the past two years on many occasions we have found it most inconvenient and in some cases downright embarrassing to have to depend on this one source of supply. We are considering the erection and operation of our own foundry. We realize that to operate even a small foundry successfully it is necessary to have more than one line. In this connection we are wondering just what effect the development of plastics will have on the foundry business. We shall appreciate an expression of opinion on this subject.'"

"Seems to me," I said, "this eminent citizen had you kind of pushed into a corner."

"Well," said Bill, "I'll tell you. My first impulse was to write that I had no crystal ball and that I made no pretense of any ability to peer into the future. However, I begged him to accept my thanks for the implied compliment in asking for my opinion on the advisability of operating a foundry as part of his business. Offhand and without an intimate knowledge of the present business setup, but bearing in mind that he has conducted a business for the past 15 years, I should say 'Go ahead.' Fundamental principles of operation and conduct are the same for the successful conduct of all business enterprises. As a consistent, life long and dyed in the wool foundryman, my judgment may be biased to some extent, but I am quite confident there always will be a demand for castings. Competitive materials appear now and again and naturally attract some attention. Proponents make extravagant claims. He probably remembered a few years ago when interested shouters from the house tops claimed that the foundry industry was doomed. Everything was to be welded. Gradually the hullabaloo died down. Welding settled down into its own legitimate field. The process has advantages and disadvantages, depending on conditions and circumstances.

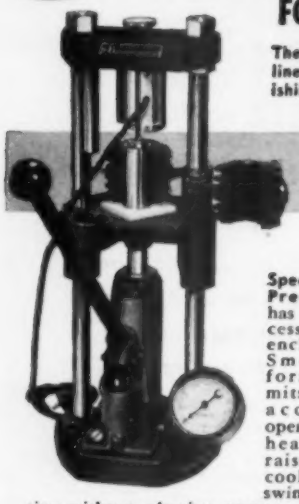
"At present the plastic industry is receiving a great deal of attention and as usual with anything new, it has been publicized extensively. Much of the publicity has been written by men who do not know whether the product grows on trees like coconuts, or is dug out of the ground like potatoes. Their one consuming desire and object is to

WHY INDUSTRY USES
SCHRAMM
AIR COMPRESSORS
There are many compressed air jobs to be done in Industry, and into this versatile picture fits the Schramm Air Compressor. Either portable or stationary, Schramm enables compressed air jobs to be done quickly—easily—economically!
Schramm Compressors are *better* because they are 100 per cent watercooled . . . compact and lightweight . . . have mechanical intake valve and forced feed lubrication!
Schramm's come in a variety of sizes. So whatever your need for compressed air . . . there's a Schramm to do the job. Write today for illustrated booklets and plan to use a Schramm in the New Era now facing industry!
SCHRAMM INC.
THE COMPRESSOR PEOPLE
WEST CHESTER • PENNSYLVANIA

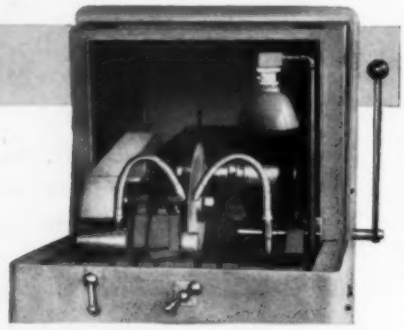
Buehler

SPECIMEN PREPARATION EQUIPMENT AND SUPPLIES FOR THE METALLURGICAL LABORATORY

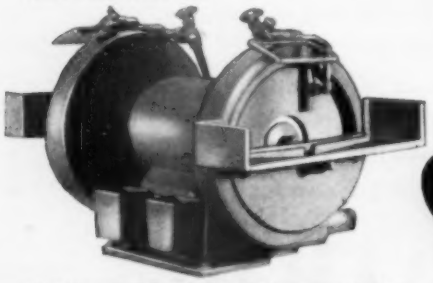
The items illustrated are selected from the complete Buehler line of equipment, tools and accessories for molding and finishing specimen mounts.



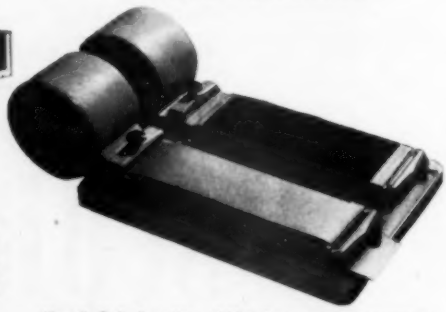
Specimen Mount Press No. 1315 has complete accessibility, no enclosed parts. Smooth performance permits speed and accuracy in operation. Solid heater can be raised and the cooling blocks swing into position without releasing pressure on the mold. This rapid cooling permits production of transoptic mounts in a few minutes. Shipping weight, 100 lbs.



Abrasive Cut-off Machine, Model No. 1000, is a solidly built, heavy duty piece of equipment free from sideplay or vibration with capacity for cutting specimen sections up to 3-1/2". Cutting is done on the front of the wheel and is controlled by a convenient outside lever. The driving motor is a totally enclosed ball bearing, 3 hp. with a separate motor driving the self-contained cooling system. Overall dimensions of cabinet 31" x 47" x 64". Shipping weight, 1400 lbs.



Wet Power Grinder No. 1210, powered with a 3/4 hp. totally enclosed ball bearing motor has two 12" water cooled wheels fitted with closed-in guards and non-shatterable shields. Suitable for coarse and medium grinding. Shipping weight, 310 lbs.



Hand Grinder No. 1410 is a most conveniently arranged two stage grinder. The grinding surfaces are 4-1/2" x 12-1/4" each with heavy 7/16" thick plate glass back. A reserve roll of 150 feet of emery paper is contained in drums for quick renewal of grinding surface. Base has gutter drains for surplus liquid in wet grinding operations. Shipping weight, 95 lbs.

Standard Polisher No. 1500. A complete unit with direct mounted ¼ hp. radial thrust ball bearing motor. The 8" polishing disc is attached to a tapered arbor on the motor shaft by means of a stout sleeve. This sturdy construction and unusually smooth vibrationless operation helps to prevent pitting and amorphous film in polishing. The removable splash ring forms a convenient hand rest that aids the operator in precision work. A handy control lever on the mounted switch gives selective speeds of 575 and 1150 r.p.m. Shipping weight, 100 lbs.

Low Speed Polisher No. 1505-2, is particularly adapted to final stage polishing and for non-ferrous metal samples. The 8" disc is attached to a countershaft by a tapered sleeve with a long span between bearings, a construction feature that assures smooth operation. The selective speeds of 150 and 250 r.p.m. make this polisher perfectly adapted to the wax lap or lead lap polishing technique. Shipping weight, 105 lbs.

Either the standard or low speed polishers can be furnished in a single unit table model polisher No. 1516. A three unit table model No. 1540 is also available for maximum convenience in three stage polishing.

In the complete line of Buehler accessories and supplies for the metallurgical laboratory are found: Abrasive paper sheets, discs, and rolls in every grade • polishing solutions • polishing cloths • cut-off wheels and molding powders. Buehler service includes everything needed for preparing precision specimens from metallurgical samples, available from one reliable source.

Buehler Ltd.
A PARTNERSHIP
METALLURGICAL APPARATUS
165 West Wacker Drive, Chicago 1, Illinois

make their news as sensational as possible. In their bright lexicon, accuracy is conspicuous by its absence. This is a human trait, first developed in children who crave attention, and who are willing to prostitute the great virtue of Truth for momentary notoriety.

"Plastics have a place and gradually will occupy that place in a perfectly legitimate manner. However, they cannot replace castings in an exceptionally wide field, a field that has expanded steadily year by year, and is bound to extend still farther when the present restriction dams are broken. When the dove of peace, instead of the screaming war eagle, once more takes up its abode in the Capitol of these United States.

Plans for Veterans Discussed

American Management Association, 330 West 42nd street, New York, is offering a number of pamphlets ranging from 30 to 50 pages, and in price from 50 to 75 cents, dealing extensively with problems confronting employers in the placing, employing and rehabilitation of discharged service men.

Personnel Series No. 76 presents a paper on "The War Manpower Outlook," by Lawerence A. Appley; "The Training and Placement of Disabled Veterans," by H. C. Hostetler; "Veteran's Employment Plans of the U. S. E. S.," by Brig. Gen. William C. Rose; "Selective Service Assistance to Veterans," by Col. Paul H. Griffith; "Case Stories, Reintegration of Veterans Into the Organization," by Stewart M. Lowry; "The Arma Rehabilitation Plan," by George Wigle.

Personnel Series No. 79, 34 pages, covers "Management's Responsibility for Human Relations," by Sam A. Lewisohn; "Some Highlights of the Labor Situation After the War," by Sumner H. Slichter; "Labor's Viewpoint," by Robert J. Watt; "Trends in Union Contract Clauses."

Subjects covered in No. 83, include "Manpower for the Final Blow," by Paul V. McNutt; "Industry's Responsibility to the Returning Veteran," by Col. Lawrence Westbrook, G. S. C.; "Selective Service and Re-employment," by Maj. Gen. Lewis B. Hershey; "The International Harvester Plan," by Troy P. Wakefield; "Labor's Viewpoint on Veterans' Re-employment," by Ted F. Silvey; "Seniority and Re-employment of Veterans," by Walter J. Couper.

Personnel policies of reconversion are discussed in No. 84 to the extent of 42 pages. The first paper by Guy B. Arthur Jr., is followed by "Formulating Company Policies," by Charles A. Meyers; "The Manpower Outlook in the Reconversion Period," by William Haber; "Lockheed's Reconversion Plans," by Dwight L. Palmer; "The Federal-Mogul Policy," by William L. Rainey;" The Mallory Re-employment Plan," by A. E. Sinclair; "Tests for Personnel Policies," by Morgan C. Monroe.

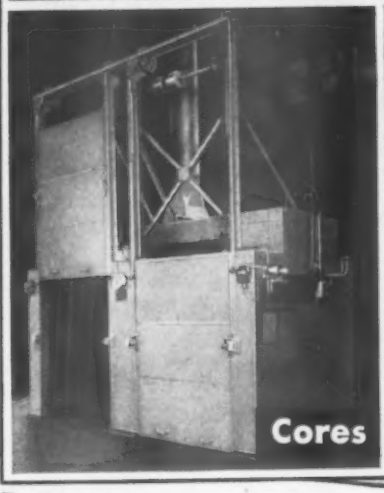
A Letter of Interest to Prospective Oven Buyers

[The unsolicited letter quoted here was written by a man who is himself an engineer.]

"While I have never been a member of Young Brothers' organization, I have worked with their engineers since 1926. I've seen them tackle a good many tough jobs in that time—jobs which seemed almost impossible at the outset. But they always came through.

"To you men who contemplate an oven installation, especially if it is out of the ordinary, I would definitely recommend that you talk it over with one of Young Brothers' engineers. Their experience (the company has had 40 years of it) may save you a lot of money as well as time."

Automatic Dip Japanning



Cores

Coatings

Heat Treating

YOUNG BROTHERS COMPANY

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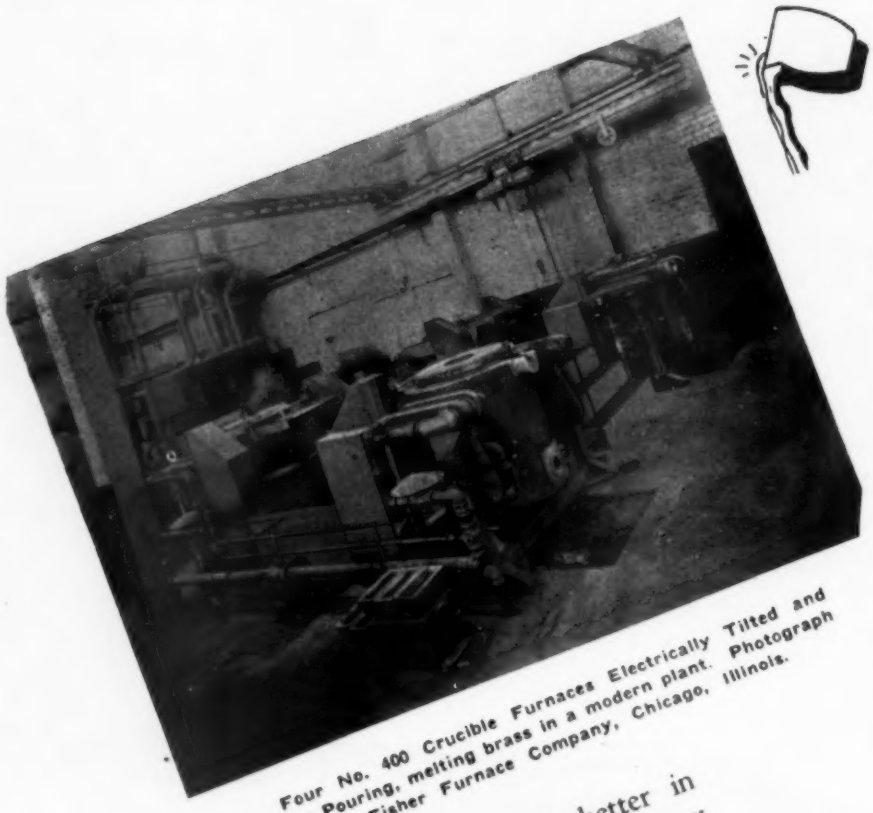
YB CO

CRUCIBLES for EFFICIENCY



Four No. 400 Crucible Furnaces Electrically Tilted and Nose Pouring, melting brass in a modern plant. Photograph courtesy Fisher Furnace Company, Chicago, Illinois.

YOU can melt nonferrous metals better in Crucibles. Added to all the advantages and economy of Crucible melting, is the permanent savings of low investment cost.

Less dollars by far to install, fewer dollars per ton of melt, and surer satisfaction in operation every working day of the year. Those are your Crucible dividends.

Before you invest in nonferrous melting equipment of any kind, check up thoroughly on this lower investment cost of Crucible furnaces. They can save you money.

* * *

For efficiency tips on Crucibles and Crucible melting, write for the **Crucible Melters Handbook**

No. 6 of a series of typical Crucible installations

CRUCIBLE MANUFACTURERS ASSOCIATION

90 WEST STREET, NEW YORK 6, NEW YORK

SOLIFICATION OF METALS

(*Continued from page* 108)

crystal habit is the same. The matter is of little importance to the foundryman.

For practical purposes, the composition of the phases in equilibrium with one another at various temperatures is recorded on constitutional or equilibrium diagrams. If one knows the composition of the phases in equilibrium, their relative amounts can be calculated by simple arithmetic.

In studying the physical properties of substance for use in connection with our major problem, we find them to fall into three groups. Those influencing the transfer of heat through the metal, through the mold material and between the metal and the mold; those which determine the changes of dimension accompanying changes of temperature and changes of state, and those properties of the liquid metal which determine its ability to flow into voids.

The constant of proportionality which determines how much heat will be conducted across a given plane of unit area for a given temperature gradient is called "the conductivity of the substance." It is an observational constant, differing with different substances, and changes with the temperature. It is sometimes convenient to know that the electrical resistance of a metal is, in general, closely related in theory to its thermal conductivity.

Measure Heat Transfer

The amount of heat required to heat a unit mass of a substance 1 C is called its "thermal capacity" or "specific heat." When heat is transferred into a body, the amount by which the temperature is raised depends upon the specific heat of the substance and its density. Since we are ordinarily concerned with the flow of heat to a given distance, this must be translated into the capacity per unit of volume.

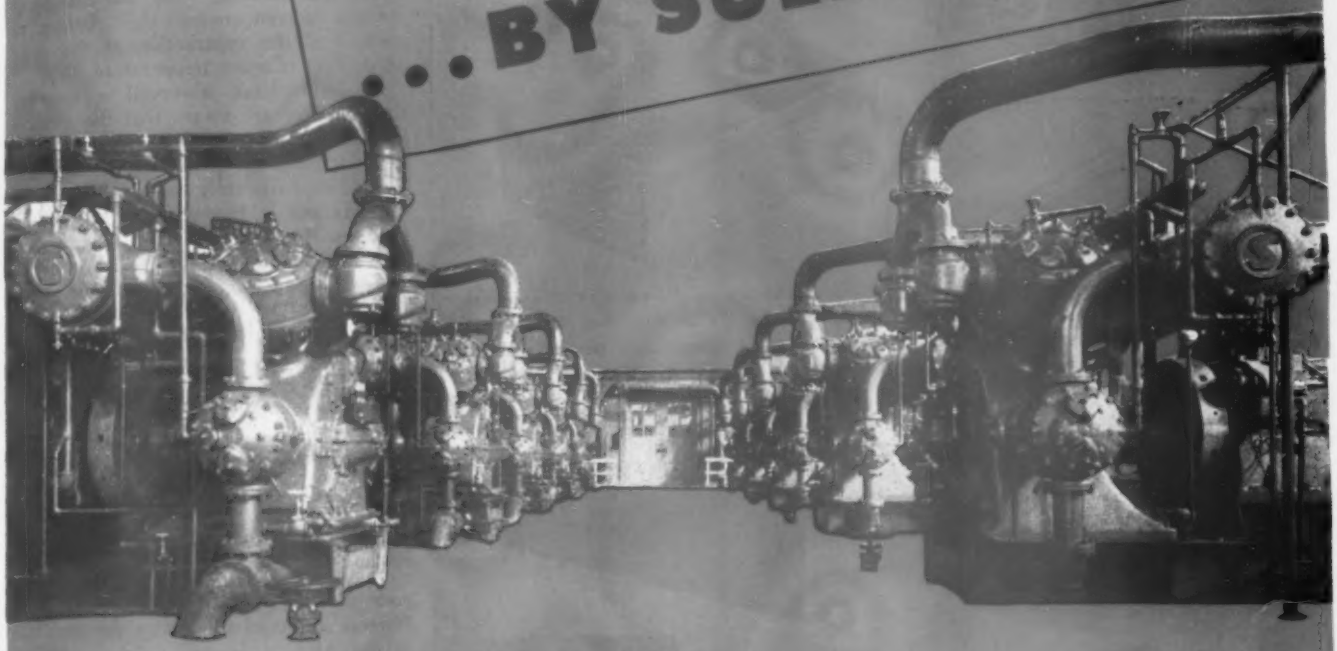
If we wish to associate the rate of heat flow with the change of temperature experienced by the body, we use an artificial physical concept called "diffusivity," which is calculated from the constants just referred to. Specific heats and densities are observational constants and change with temperature. Very symmetrically crystalline substances can have their specific heat calculated by a relation called the "Debye function."

Since we are dealing with the freezing processes, a most important thermal property of the metal for the foundryman is its latent heat of fusion. This represents the heat energy required to tear apart the bonds holding the atoms together in the crystal, without greatly altering the distance by which these atoms are separated.

There is a rule called "Trouton's", undeservedly much disregarded, which correlates the latent heat of fusion with the melting point of the substance. Although

(*Continued on page* 212)

AIR POWER
...BY SULLIVAN



A recognized leader in the air compressor industry, Sullivan has pioneered in the development of all types of air power. Sound engineering design, better materials and finer workmanship have produced air equipment which most of the prominent industrial firms in America have selected . . . a tribute to Sullivan dependability, economy and efficiency. Sullivan gives you air compressor superiority that comes from over 94 years experience with air power problems all over the world. If the job is done with air . . . you can do it better with Sullivan Air Equipment. Sullivan Machinery Co., General Offices: Michigan City, Indiana. In Canada: Canadian Sullivan Machinery Co., Ltd., Dundas, Ontario.

AIR COMPRESSORS FROM ¼ TO 3,000 H.P.

SULLIVAN

PRODUCTS

Stationary and portable air compressors from ¼ to 3,000 H.P., pneumatic casting grips, foundation breakers, portable hoists, rock drills.

OFFICES { Seattle, Boston, New York, Chicago, Portland, Pittsburgh, St. Louis, Detroit, San Francisco, Birmingham, Knoxville, Huntington, Los Angeles, Duluth, El Paso, Butte, Salt Lake City, Scranton, Denver, Dallas

Stacking or Piling Box **of excellent design, strong and durable. Any size, to suit your needs. Above: Triple Hem Shop Box made with straight or tapered sides.**

TO KEEP PRODUCTION

flowing smoothly

Where small, loose products are used or produced, perfecting the materials handling system is often the most important factor in attaining lower production cost. An essential part of the system is properly designed, light and strong metal shop containers for the pickup, collection, and conveyance of materials to and from machines, finishing, assembly, packaging and storage.

Cleveland shop boxes, barrels, cans, pans and pails are usually custom-made, because the small extra first cost is trifling compared with the advantages gained, year in and year out, by having containers of exactly the right size, shape and design to fit individual needs and special handling requirements.

Catalog, prices, and design service on request, without cost or obligation.

SHOP EQUIPMENT DIVISION

Cleveland Wire Spring Co.

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Cleveland

STEEL SHOP EQUIPMENT

STOCK STYLES FOR GENERAL UTILITY

BUILT-TO-ORDER to meet special requirements

(*Continued from page* 210)

the rule is not accurate, it frequently permits useful estimates where actual knowledge is lacking. For the purposes of foundry physics, the specific heats of the components of an alloy usually can be taken as additive, although again this is not rigidly true.

The change in volume when a superheated metal becomes a solid at room temperature is made up of three portions: the contraction of the liquid while cooling from its original temperature to the melting point, the change of volume accompanying the change of state, and the contraction of the solid on cooling to room temperature.

All who have observed a mercury thermometer are aware that the amount by which a given amount of liquid metal expands for a given increase in temperature is approximately independent of the temperature. However, this coefficient of thermal expansion is different for different substances. Most metals contract in the process of freezing. Type metal expands, as does high carbon gray iron.

The coefficient of thermal expansion of a solid varies with the temperature, and, for a given metal, is proportional to its specific heat, regardless of temperature. This principle is sometimes of use in obtaining one of its properties if the other is known.

When alloys freeze selectively, the change of volume during freezing takes place over a temperature interval. The change of volume of cast iron has been very thoroughly studied at the National Bureau of Standards under the auspices of the AFA.

Shrinkage No Longer Detectable

The author has had occasion to observe that spheres cast experimentally from various white cast irons have the same apparent density, whether they show evidence of gross internal shrinkage or not. The explanation is merely that if the shrinkage does not all go to one place, an equal volume is distributed finally throughout the entire mass and is no longer detectable.

The foundryman's consideration of the "Solidification of Metals" must lead to the flow of metal from the feeder into the voids, be these large cavities or microscopic fissures. Therefore, one must have some understanding of the laws governing the flow of liquid in pipes or channels.

The surface layer of metal in contact with the solid wall probably does not move forward at all. The layers further in move forward, each with a higher velocity than its outside neighbor. The metal thus advances by a process resembling its turning itself inside out continually. The property of the metal which resists such flow is called "viscosity."

The calculation of the rate of flow of liquid of known viscosity in simple pipes or channels is well understood. The foundryman judges this property by pouring a special casting called a "fluidity spiral," and determining how far

(*Continued on page* 214)

Now Available

TO EVERY FOUNDRY

MAINTAINS PERMEABILITY

INCREASES PERMEABILITY

MINCO BOND

WHAT IS MINCO BOND:

Let us pause in our series of advertisements covering the manner of using MINCO BOND in American foundry practice, to tell the trade just what MINCO BOND really is.

MINCO BOND is an unclassified Mineral.

It is not a fire clay because it is 50% lighter than fire clay.

It is not a Western Bentonite for unlike Western Bentonite it has little or no expansion or contraction. It has higher dry strength than Western Bentonite yet it has high collapsibility and high flowability.

It is not a Fullers Earth yet it has greater medicinal qualities than Fullers Earth.

It is almost a neutral mineral with a pH. of approximately 7.5. We get a pH sometimes 6.89 and 7.2 and we advertise a pH of 7.5. A neutral substance is Distilled Water which has a pH of 7.0. Science never dreamed of ever finding a natural neutral mineral substance and the discovery of MINCO BOND as an almost perfect neutral astounded the scientific world three years ago. It is to this neutral condition in MINCO BOND that its outstanding characteristics in foundry practice are attributed.

Its neutrality is based entirely upon its combination of minerals shown in its chemical analysis as follows:

SiO_2	(Silica Dioxide)	41.44
Fe_2O_3	(Ferric Oxide)	4.20
Al_2O_3	(Alumina Oxide)	12.60
CaO	(Calcium Oxide)	14.20
MgO	(Magnesium Oxide)	6.06
Ign Loss		18.09
		96.59
Specific Gravity		2.65
Ph—Approx.		7.5

Castings which are poured when MINCO BOND is used in the molding sand DO NOT BLOW. This characteristic is due to the fact that MINCO BOND throws out 15% inhibitor when in contact with high temperatures. This stops the thermite reaction in casting which eliminates BLOWS.

MINCO BOND (this high combination of oxides) has revolutionized foundry practice and has proven its high durability, high flowability, and high collapsibility in foundries throughout the United States and Canada. Its Calcium Oxide content combined with its other oxides gives it the ability to pour castings with the cleanest, smoothest surface, which no other foundry bond can equal.

It is also this rare combination of oxides that gives MINCO BOND another outstanding characteristic which we would like to prove to you, that is, that MINCO BOND IS THE ONLY MINERAL BOND KNOWN TO FOUNDRY SCIENCE, WHICH MAINTAINS AND SLOWLY INCREASES PERMEABILITY. Now is the time, while reconverting, to have us prove these things.

MINCO PRODUCTS CORPORATION

SAGINAW, MICHIGAN

WARNER R. THOMPSON CO.
7328 Hamilton Ave., Detroit, Mich.

THE BUCKEYE PRODUCTS CO.
7020-34 Vine St., Cincinnati, Ohio

MARTHENS COMPANY
1205 4th Ave., Moline, Ill.

FOUNDRY SUPPLIES CO.
461 W. 33rd St., Chicago, Ill.

HOFFMAN FOUNDRY SUPPLY CO.
1193 Main, Cleveland, Ohio

WM. R. BARNES COMPANY, Ltd.
243 Cumberland Ave., Hamilton, Ont.

WOLVERINE FOUNDRY SUPPLY CO.
3213 Bellevue, Detroit, Mich.

SHANAHAN'S LIMITED, Vancouver, British Columbia · SHANAHAN'S LIMITED, Winnipeg, Manitoba

QUALITY

IS NOT AUTOMATIC . . . IT HAS TO BE DEVELOPED MEN OR PRODUCTS, DRESSED UP FANCY, ARE NEVER "QUALITY" UNLESS THEY CAN MEET SPECIFICATIONS

Formerly in the British Isles, many persons of no consequence were termed "The Quality", merely because they inherited names, wealth or titles. Robert Burns saw through this sham when he wrote "A man's a man for a' that!" In America, as well, we have our pretenders to "The Quality"—frauds who confuse veneer with worth. With ALLOYS, quality CAN'T be faked. The instant an alloy fails to meet rigid requirements and specifications, its only practical use is that of scrap. NIAGARA FALLS SMELTING & REFINING CORPORATION ALLOYS really belong to the true "Quality". Every pound of every shipment you receive will be the exact quality you specify. They meet every test, rise to every requirement. Consult with us on ANYTHING in alloys—give us the specifications, and we'll deliver the order, WHERE and WHEN you want it.

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NIAGARA FALLS SMELTING & REFINING CORPORATION

America's Largest Producers of Alloys

BUFFALO 17, NEW YORK

(*Continued from page* 212)

down this spiral the metal will flow under a given head. This method is exceedingly useful, although it does not actually measure viscosity.

There is a limit to the size of passage into which a liquid will flow. Because of the unbalance of forces on the atoms at the surface of a liquid, the latter behaves as though it were surrounded by an elastic skin. This is a property called "surface tension," which can be measured. It depends upon the substance, the temperature, and very greatly upon the presence of impurities.

However, for any given surface tension and pressure there is a passage so small that the metal cannot enter because the surface tension forces hold it back. This is quite fortunate because if there were no surface tension, the metal would not stay in the mold but would permeate deeply between the sand grains.

It is, of course, necessary that there must be some sort of a pressure head to cause liquid metal to flow through a narrow passage. This means that there must be some way of having atmospheric pressure reach the surface of the liquid metal in a feeder, or the layer cannot supply liquid.

Since many metals, on freezing, evolve gases which enter the shrinkage cavities, counterpressure which actually forces the last freezing metal out from the interdendritic spaces may be set up. There is, therefore, a necessity for studying solubility of gases in liquid and solid metals.

Plastic Shell May Be Expanded

Some metals, on freezing, reject solid nonmetallic impurities which interrupt the continuity of the metal and have an effective equivalent to voids of similar shape and size. If its sonims form while the metal is entirely liquid, they try to float upward at rates depending on their size, the difference in density of the metal and sonims, and the viscosity of the liquid.

In the early stages of freezing, the solid shell is quite plastic and may be expanded by internal pressure, with a corresponding effect on the amount of shrinkage void to be filled.

Data have been gathered on the contraction of steel freezing under restraint, which furnish a basis for exploring this subject. The progressive freezing desired by the foundryman can be had only if the rate of heat transfer from the liquid to the solid is such as to produce the first freezing in those regions most distant from the feeder. It therefore becomes necessary to consider the entire subject of heat flow.

An enormous amount of work has been done on this subject which cannot be even outlined under the circumstances of this abstract. In the full text of the paper some pertinent examples have been discussed.

It is of some interest to know what will be the shape and location of the void

(*Continued on page* 216)

No need to "raise the roof" to boost core output with this new DESPATCH CORE-BAKING OVEN

Despatch combination gas-oil fired oven, 13 ft. wide, 27 ft. high, 52 ft. long. Has variable speed continuous conveyor.

Cores make 2 horizontal passes thru bake chamber, then enter fan-equipped cooling section. Cores are unloaded at lower right, then immediately reloaded.

DESPATCH BATCH TYPE OVEN.

DESPATCH DRAWER TYPE OVEN.

Added Advantages

1. SAVES FLOORSPACE. Platform-mounted heater, fans, controls, plus compact overall design, allow more work space on foundry floor.

2. ALLOWS FAST, EASY HANDLING. Built-in cooling section provides fast, uniform cooling. Eliminates fumes. Allows speedy unloading and reloading without delay.

3. STRAIGHTENS COREMAKING LINES. Unique design permits single open loading-unloading area, easily reached from all sides.

4. REDUCES BAKING COSTS. Efficient system recirculates up to 75% of heated air. Guarantees fast, even, low-cost baking.

Thanks to this ingeniously designed Despatch Oven, foundry officials *didn't have to raise the roof* to get what they wanted in core-baking output!

Confronted by limited floorspace and a comparatively low roof, Despatch built the oven to carry 38 long (7½′x2′x3′) core racks suspended from a continuous conveyor chain. Conveyor makes several *horizontal* passes through baking and cooling chambers.

This design allows ample baking capacity up to 84 tons per day . . . it gives the foundry much-needed floorspace . . . and it allows the entire unit (only 27 ft. high) to fit easily under the roof.

CALL A DESPATCH ENGINEER for help in selecting the right oven for your foundry. All types, sizes and fuels. Address:

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Despatch Oven Co.
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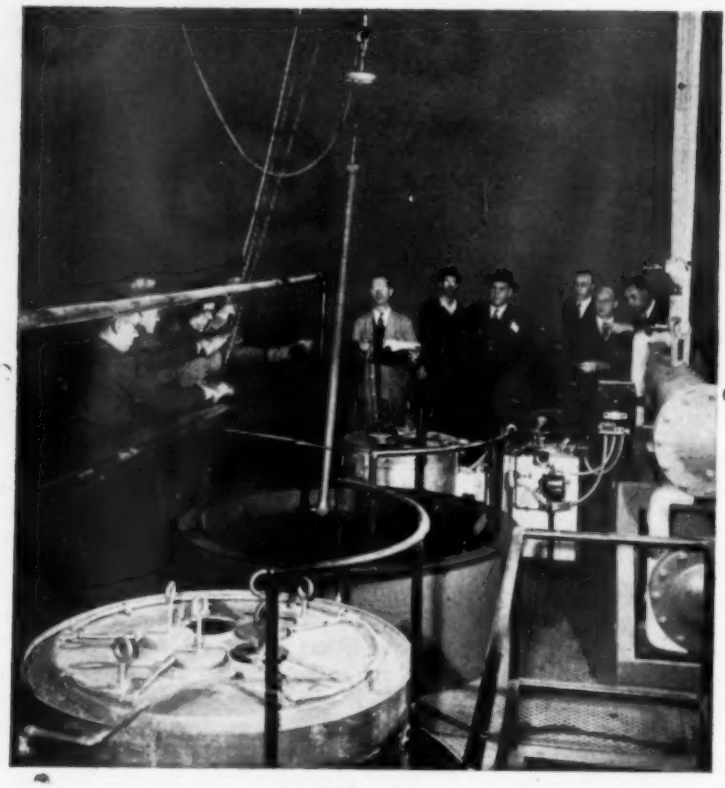
Chicago 1, Illinois

DESPATCH OVEN COMPANY MINNEAPOLIS 14 MINNESOTA, U.S.A.

BELLEVUE *Controlled Atmosphere* FURNACES



In the construction of BELLEVUE "Controlled Atmosphere" FURNACES, painstaking consideration of the job to be done comes first. Every factor must be evaluated, every condition studied. Only then do Bellevue engineers attempt design and recommendation of furnace type. The soundness of that policy is being demonstrated in plant after plant. Hundreds of executives in scores of varied companies have proved, to their own satisfaction, the efficiency, speed, high production level and operating economies of BELLEVUES that were "designed" for the job. You, too, will find Bellevue experience and facilities a profitable investment for your own furnace needs.

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BELLEVUE
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2975 BELLEVUE AVE. DETROIT 7, MICH.

(*Continued from page* 214)

which is left when metal freezes. In the case of a cylindrical casting losing heat only from the outside surface, a pipe will extend as a thin thread clear to the bottom of the casting. If the casting cools from the bottom also, or if it is conical instead of cylindrical, or if it is poured slowly enough to establish temperature gradients, other forms of shrinkage voids will be established.

Mathematical studies of the freezing of simple shapes have shown that whether the casting will show an internal shrinkage void, or a "sink" at the top, is a function of the degree of super heat of the liquid metal. This is a point of possible importance to the foundryman.

If the writer has been at all successful in his purpose, it will now be clear that most of the problems connected with the solidification of metals, both in the abstract and in the sense of making solid castings, can be solved by the application of the classic principles of physics.

The existing difficulties arise out of experimental handicaps in determining some of the constants involved, and out of the mathematical difficulty incident to obtaining solutions of the equations corresponding to the rather complex shapes and conditions with which the foundryman is concerned.

Have Mechanized Considerably

It was pointed out by Bolton in the first Foundation Lecture ("Foundry Metallurgy," 1943), that foundries have availed themselves of mechanization to a truly remarkable extent. This is, in part, perhaps due to the fact that the mechanical devices were constructed by people who wanted to sell something to the foundries, and brought to us approximately finished plans by which it was expected that money could be saved.

In *Foundry Metallurgy* it was also pointed out by Bolton that very considerable progress was made, but not within the industry. This branch of science has been used mainly in connection with the control of the properties of the metal and, to some extent, with improvements in melting and heat treatment.

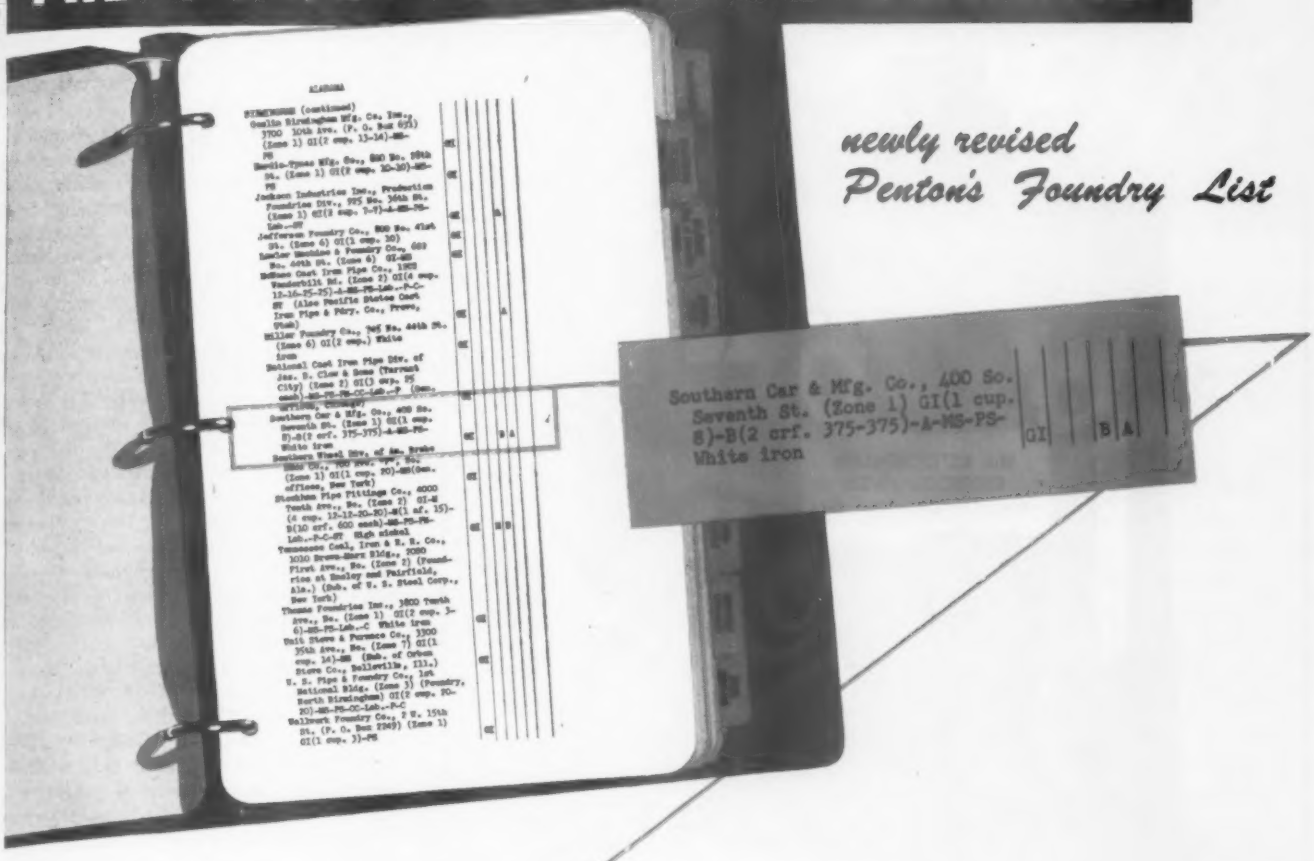
What is really the most fundamental problem in the foundry industry, the making of castings, has been almost neglected. Only in the field of the properties of molding sand has technology been thoroughly applied to improve the molder's craftsmanship. If foundries are to come out of the dirt and become places for the practice of engineering skill, then this most important field can no longer be neglected. Perhaps the present paper has suggested the direction in which the foundryman might look to the physicist for help.

On the other hand, it is unfortunately true that the physicist has been almost entirely neglectful of the extent to which his science could be used in the making of castings. At the moment the writer is able to think of but one trained physicist who became a foundryman.

In our struggle to substitute technology for craftsmanship, it will be neces-

(*Concluded on page* 218)

AID TO BETTER SALES PLANNING



newly revised
Penton's Foundry List

WHAT IT IS

PFL is a biennial census of the foundry industry compiled by the Penton Publishing Company. The newly revised edition is just off the press and provides you with up-to-date market information at less than 1c a name. Nowhere else is so much foundry information available for so little.

WHAT IT DOES

PFL gives you accurate market information on

—The names and addresses of all foundries.
—Type and number of melting units.
—Capacity of melting units.
—Type of metal melted.
—Departmental operations. (Pattern shops, machine shop, laboratories)

HOW IT HELPS YOU

PFL aids your sales manager in

—finding and evaluating new prospects
—scheduling service and engineering calls
—analyzing sales territories
—determining market size and scope

Valuable to your advertising department in revising and correcting your mailing lists.

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THE PENTON PUBLISHING COMPANY

Book Department

1213 WEST THIRD STREET — CLEVELAND 13, OHIO

Publishers of

THE FOUNDRY

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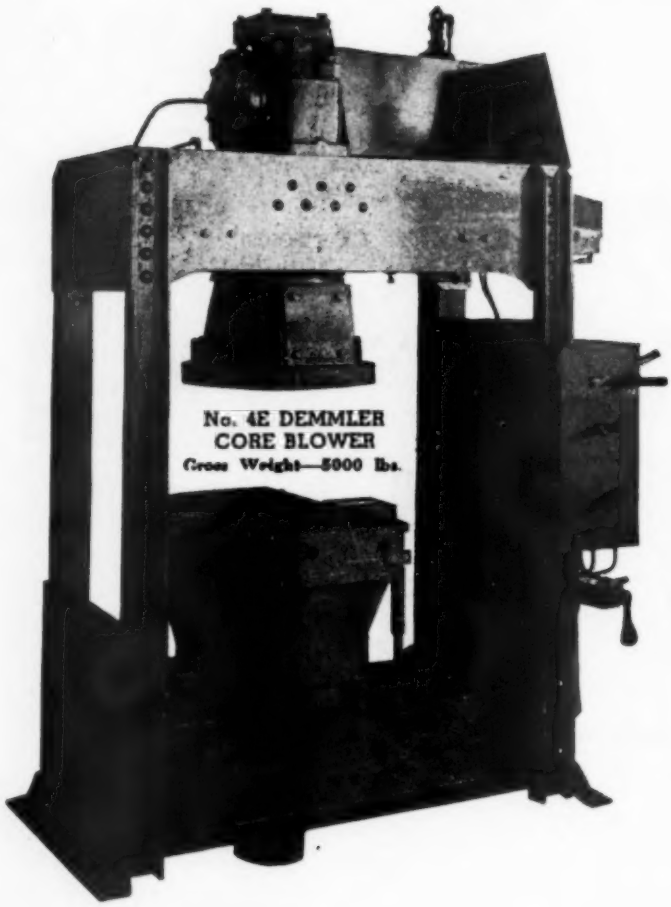
DEPENDABLE **CORE BLOWING** EQUIPMENT



NEW HEAVY-DUTY BLOWER

FOR MOTOR CASTINGS WORK...

Strictly for BIG Cores and Fast Production
Takes Core Box up to 18" x 24"

Designed as a special blower for a leading producer of airplane motor castings, this unit is now offered as a standard Demmler blower. Features include an accurate hydraulic core box draw, table equipped with Timken rollers, 12" diameter throat opening, control mechanism totally enclosed. The height of the frame may be adapted to varying sizes of core boxes.

Reports on this new machine from users indicate that it has unusual possibilities in production of aircraft, tank and truck motor castings. At the present time we can make good deliveries, and invite your inquiries.

WM. DEMMLER & BROS. · KEWANEE, ILLINOIS

CORE BLOWERS *Exclusively*

(*Concluded from page 216*)

sary to attract the attention of those who have specialized somewhat in mathematics and physics. So far we proceed by rule of thumb. The physicist could help us proceed along scientific lines. Unfortunately, the physicists have largely directed their attention away from such problems which would interest us as foundrymen.

In 1893 the illustrious von Helmholtz, speaking at Chicago, said that there were no new principles to be discovered in physics, and the only remaining fields were in the direction of greater precision of knowledge. Two years later Roentgen discovered the x-ray, and the science of physics has never been the same since that time.

The impact of Roentgen's discovery on the study of radiation and the structure of matter was so great that apparently the higher qualified physicist could no longer interest himself in the more mundane fields. The physicist interested in the application of electricity has generally found an outlet for his energies in electrical engineering, but the physicist interested in heat problems does not seem to have been aware of the enormous practical field awaiting his efforts in the foundry.

Addressing the international foundry congress in London in 1939, Sir W. Lawrence Bragg, Cavendish professor of physics at Cambridge University, England, made the statement that what industry needs is a group of people who can interpret the findings of the pure scientist for the benefit of industry. The author has attempted here to contribute his modest efforts along the lines suggested by Professor Bragg.

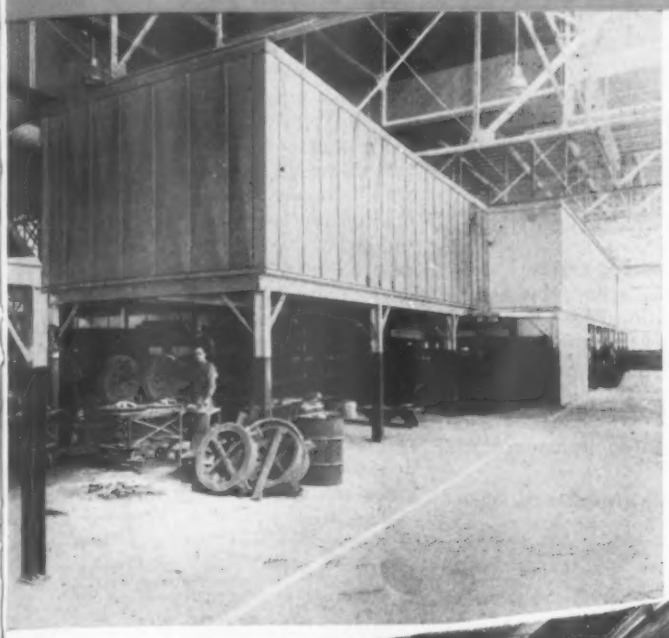
If some physicist can be persuaded to deal with the problems of heat conduction under the circumstances that interest the foundryman—if our engineers can take these facts and translate them into operating principles, then our foundries will be able to make, systematically and continuously, and without so much "cut and try," castings much superior to those now produced.

Offers Study Course On Measurements

Continental Machines Inc., 1301 Washington Ave. S., Minneapolis 4, has prepared a correspondence course on the science of measurement. Clearly and concisely written and illustrated, the course should be of particular value to plant inspection departments. The series of lessons is presented in eight booklets under the following titles: Progress in Precision; Inspection and Care of Gage Blocks; Use of Gage Blocks; Accessories of Precision; The Sine Bar and Its Uses; Measuring to a Millionth with Optical Flats; The DoAll Comparator—Threads and Gears; Mobile Inspection Unit—How to Set Up a System. The lessons are spaced to cover a two-month period. Mailings are made to homes on the basis of one lesson per week.

There's no better time to *invest* in modern

ROSS CORE OVENS



STATIONARY CONTINUOUS CONVEYOR

After V-Day, just as now, core quality and speed of production will be the chief factors in determining competitive standing. Whether Gray Iron, Magnesium or Aluminum, the future quality standard required of castings will demand better cores from which to make them. And core quality can be no better than the oven that bakes them.

ROSS Core Ovens, in a range of sizes and types for all requirements, are designed with the exclusive ROSS heating and circulating system that positively insures greater Uniformity, Elimination of Rejects, Increased Output in Less Time and in Less Space. The best proof of the remarkable performance of ROSS OVENS is the list of

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The ROSS System of heating and circulation might be applied to improving your present oven. Why not ask us about this? No obligation.

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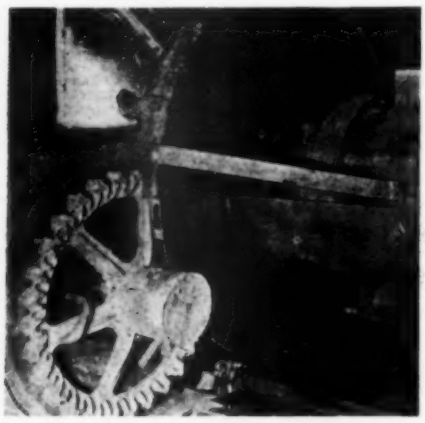
STEEL CASTING RISERS

Cut Quickly by Friction Saw

A METHOD employed by one foundry for quickly removing hollow risers from cast steel sprocket wheels is shown in the accompanying illustrations. Using a friction saw and a special support fixture which provides accurate mounting and slow rotation of the casting, the risers are removed in a floor-to-floor time of 40 sec. The sawed surface is at an accurate distance from the back edge of the rim, thereby eliminating subsequent grinding.

The saw employed, furnished by Kling Bros. Engineering Works, Chicago, has a 48-in. diameter blade with 12-in. projection and is driven by a 50-hp motor. Rotation of the casting provides a short average length of blade contact and permits use of a smaller blade projection than otherwise would be required for the outer saw flange to clear the body of the casting. The entire support fixture is mounted on a pivoted trunnion and rollers so that it can be moved entirely out of position and permit the saw to be used on other castings held in simple stationary fixtures mountable on the saw table.



The friction saw cuts by means of the rapid generation of heat in rubbing the blade rim against the work in a manner that dissipates the heat from the blade but concentrates it on the material. The immediate temperature rise of the material contact surface is so great that its strength is reduced considerably below that of the colder blade rim. This heated surface is readily removed by blade and permits complete severing of the material. With considerable cutting through several hours of operation, the blade rim eventually will deform sufficiently to require redressing by a simple hobbing process.

General conditions for severing gates or risers from steel castings by use of this type saw are outlined by Kling Bros. Engineering Works as follows:

1. The body of the casting must be securely locked in a position so that the desired plane of the sawed face will be parallel with the outside plane of the blade.

2. The surface upon which the blade first makes contact must be flat to permit engaging the full width of the blade rim at the start of each cut. Starting the cut on a fillet should be avoided if at all possible.

3. The blade projection beyond the saw flanges must be sufficient to sever the riser without interference against either the riser or the body of the casting.

4. Relative motion between the casting and the blade must be parallel to the plane of rotation of the blade. The work can move to the blade, or the blade can move to the work. The direction of the motion should provide the shortest maximum length of blade contact during the period the cut is in operation.

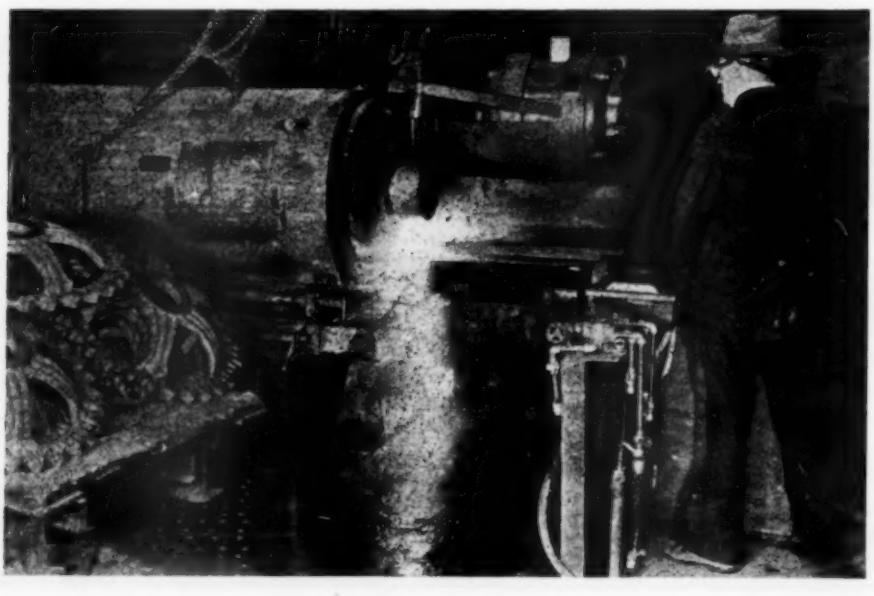
5. Uniform blade rim speed must be maintained for the entire cut regardless of the length of contact. This requires uniform loading of the blade driving motor which may be obtained only with uniform pressure of the blade against the section. The drive motor must have enough capacity, therefore, to operate at a uniform load during the entire cut at a high enough value to permit cutting on the longest length of contact.

6. Heat dissipation from the blade rim is necessary for the entire duration of each cut to prevent the rim from reaching a temperature at which it will deform or weld to metal being removed.

7. In order to sever large diameter sections, where the maximum length of blade contact is the same for any direction of stroke, the blade must be driven with sufficient power to generate surplus heat on the largest contact surface. Each succeeding surface must reach a temperature at which its strength is enough lower than the colder blade rim to be readily removed.

8. Slow rotation of large diameter sections while in contact with a friction saw permits continuous and uniformly short length of blade contact, with the highest efficiency, shortest cutting time, and complete heat dissipation from the blade rim for the entire duration of cut.

The friction saw is intended to cut steel castings and not gray iron.



Simplified Fittings List Proposed

A proposed simplified practice recommendation for cast brass solder-joint fittings has been submitted to producers, distributors, and users, for acceptance and comment, according to an announcement by the Division of Simplified Practice of the National Bureau of Standards.

The proposal contemplates the establishment of a voluntary simplified list of cast brass solder-joint fittings representing the best thought of the industry, its distributors, and customers as to what constitutes desirable practice for the present and the postwar days to come. Sketches illustrate the 37 types of fittings, various sizes of which are included in the proposed list.

A limited number of mimeographed copies of the proposed recommendation are available through the Division of Simplified Practice, National Bureau of Standards, Washington 25, D. C.

Named Distributor

Lakeside Foundry Service Co., 39 South LaSalle St., Chicago, of which Clifford McKelvey is general manager, has been appointed exclusive distributor in Illinois and Indiana for E. J. Woodison Co., Detroit, manufacturer of foundry supplies.

Aluminum formerly set apart exclusively for War uses is now available for civilian goods.

Ample supplies of high-grade Aluminum Alloys at favorable prices now make it possible for manufacturers to start making much-needed consumer items, without interference with War production.

Many manufacturers have been planning for this time. The moment has come to execute their plans—to place their orders with suppliers to be sure orders are filled promptly.

Whether producing for military or civilian requirements, manufacturers will continue to receive top quality metal when they specify Smelters' laboratory-controlled Aluminum Alloys for all casting purposes.

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The American Metal Company, Ltd
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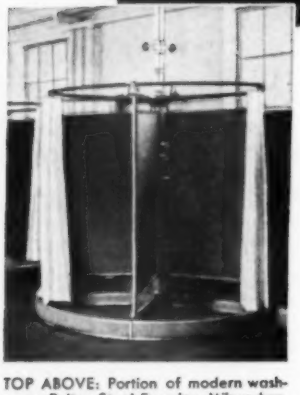
YOU'LL GET BETTER MEN
If You Provide Better Washrooms



TOP ABOVE: Portion of modern washroom, Pelton Steel Foundry, Milwaukee. BELOW: Typical space-saver Bradley Multi-Stall Shower installation.

FOUNDRIES SUCH AS THESE ARE INSTALLING BRADLEY WASHFOUNTAINS AND SHOWERS

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MORE FOUNDRIES NOW
Installing Bradley Group Wash Fixtures

Records reveal that workers have a higher rating of efficiency and are more productive on a job where their personal conveniences are properly considered. In many instances, when adequate group washing facilities were installed, employee morale improved along with quality of work produced. Then too, better workers were attracted and turnover decreased.

Sanitary Bradley Washfountains allow your men to clean up thoroughly before leaving work. Workmen can wash to the waist in the clean *running* water from the central sprayhead and there's no delay because each Bradley comfortably accommodates from 8 to 10 persons at the same time. The deep, self-flushing bowl carries away the used water to prevent contamination. In addition to maximum sanitary advantages, Bradleys save space, eliminate numerous piping connections and cut water consumption by 70%. Multi-stall Showers also offer the same comparable advantages and are available with receptors for installation on any kind of floor, including wood.

You'll find many other interesting and valuable facts about Bradley Washfountain and Multi-Stall Showers in Catalog 4308. Send for a copy today. BRADLEY WASHFOUNTAIN CO., 2217 W. Michigan Street, Milwaukee 1, Wisconsin.

BRADLEY *washfountains* AND *multi-stall showers*

Illustrated Catalog 4308 and Washroom Survey Sheet sent upon request.

RECLAIMING CORE SAND

(*Continued from page* 106)

hollow and are cooled by a stream of cold air delivered by a centrifugal blower through a tube installed in the hollow center shaft. The heated air returns through other passages in the arms to the main center shaft, and is exhausted to the atmosphere.

Access doors at each hearth permit the withdrawal of samples at any time and also make it possible to remove and replace the rabble arms quickly, and without precooling the furnace. However, this furnace has been in operation for upwards of a year, and to date no repairs or replacements of rabble arms has been necessary, nor has it been necessary to carry out any repairs on the brickwork which, from a recent examination, appears to be in excellent condition.

Sand Cushion Prevents Abrasion

As the sand is fed to the top hearth it is distributed over the surface and plowed to the center by the action of the rabble teeth. These teeth do not reach to the surface of the hearths, so that there is always a cushion of sand which prevents abrasion of the brickwork by the sand in transit. This rabbling action causes the sand to flow in a spiral path around and across all ten hearths, exposing all sand grains continuously and uniformly to the hot oxidizing gases which travel counter-currently up the furnace. Although the total hearth area is 2570 sq ft, the actual area of sand exposed, due to the ridges and furrows produced, is approximately 3500 sq ft. It is this constant turning and re-exposure of the sand grains, with resultant uniformity of exposure to the hot gases, that is responsible to a large measure for the extremely uniform product obtained and for the thoroughness with which organic binders and other carbonaceous ingredients are burned out, despite the relatively low operating temperature of 1000 to 1300 F. This low temperature has the added advantage that it does not overheat the sand, fracture the grains, or permit the fusing of associated materials.

When the sand reaches the center of the top hearth it is spilled through a large opening onto the second hearth, across which it is plowed to the outside where it falls through a series of 36 openings to the third hearth. This alternate in-and-out feeding is repeated until the bottom hearth is reached. Lute rings and caps are provided around the central shaft to prevent any sand from bypassing a hearth by spilling through the small center shaft clearance openings of the out-feed hearths.

Heat is supplied by nine variable pressure gas burners, and nine atmospheric pressure burners distributed tangentially around hearths Nos. 4, 6, and 8, six burners to a hearth. These are mounted on

(*Concluded on page* 224)

RANSOHOFF WET CLEANING MILLS

Automatic Star-Return

IT'S IN THE STARS

SIDE-LOADING,
SIDE-UNLOADING MILL

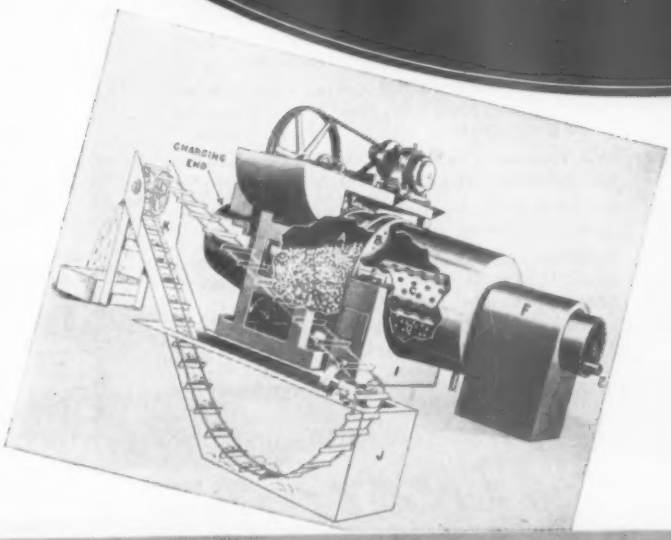
A side-loading, side-unloading mill with work and stars in place with most of the work buried for best cleaning results. Note the star-return gratings in the heads of the cleaning compartment. Castings being cleaned are malleable iron differential housings.

THE RANSOHOFF WET METHOD SAVES 30% to 70% ON YOUR CLEANING COSTS

WHY RANSOHOFF WET METHOD IS *Modern and Successful*

Cleaning is easy, gentle, economical and automatic. The work is held in suspension in a moving mass of tumbling material confined in a revolving drum. As the drum revolves the work cascades as a mass in the tumbling material. Work is thoroughly cleaned, sharp corners are preserved and every detail is sharp and distinct. Mills are not self-destructive. Dust and dust collectors are eliminated, health hazards are reduced.

Write for RANSOHOFF FIELD ENGINEERS to show you how to economize by modernizing.



BASIC DESIGN OF RANSOHOFF END-LOADING, END-UNLOADING CLEANING MILL

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NO HEALTH HAZARDS

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NO DUST COLLECTING SYSTEMS TO INSTALL

•

NO DUSTY SAND

•

NO MUD HOLES

•

NOT SELF-DESTRUCTIVE

•

SEND US A SAMPLE BATCH

N. RANSOHOFF, Inc. CINCINNATI, OHIO
Township Ave. and Big 4 R. R.

(*Concluded from page 222*)

the steel shell of the furnace, and the gas-air mixture burns directly in the hearths without any direct impingement of the flame on the sand.

Since close control of temperature is important for obtaining a high grade of finished sand, thermocouples are provided at each hearth and coupled to a recording pyrometer. The temperature and heat distribution within the entire furnace thus may be determined instantly and adjusted if necessary, or automatically maintained. Combustion gases are exhausted through the roof of the building by a stack connected to gas outlets provided in the first hearth. Natural draft is employed with a quite low stack, and although the installation is within a residential area it has not been found necessary to employ any form of dust collector on the stack.

After passing over the various upper hearths, the sand reaches the ninth and tenth hearths where a certain amount of precooling takes place, since no fuel is burned below the eighth. It is then passed through a single opening on the tenth hearth and enters the special cooler at a temperature of 700 to 800 F, which is considerably lower than its peak temperature in the furnace. The cooler consists of a steel shell containing a number of stainless tubes through which the sand flows. This rate of flow is adjusted to the out-flow rate from the furnace, and automatic means are provided to maintain the tubes full of sand at all times. Should the tubes become partly evacuated of sand, the cooler discharge mechanism is stopped momentarily, making it impossible for a rush of hot sand to occur. Rubber belting for the discharge conveyor can therefore be used with perfect safety. From the cooler the sand is carried by elevator and belt conveyor over a scalping screen of 20 mesh to remove any oxides or scraps of metal, and is then delivered to one of two classifiers. The fines are removed, and the finished product is discharged into the main storage bins from which it is unloaded by a chute into the trucks which carry it to the foundry storage bins.

Water is used as the cooling medium, and is passed through the cooler shell at the rate of 80 to 100 gallons a minute when its temperature is about 60 F, the amount varying, of course, with the temperature of the water supply. The temperature of the sand is thus brought down to between 140 F and 160 F, and the water is then used to flush out the fines collected from the entire sand handling system and classifiers, and to carry this as waste into an adjacent lake.

A central control board 15 ft long by 8 ft high carries all the control equipment interlocked into a closed system, and this is operated from a pilot board in the supervisor's office. Lights on this board indicate when each unit is in operation, and a single master pushbutton suffices to start or stop the entire combined unit.

At present, the equipment is handling 15 tons of sand per hour, and the fuel consumption is at the rate of 500 cu ft of 550 Btu gas per ton of sand. Indications are that it could be operated at considerably higher capacity if needed, without increase in the fuel consumption rate and without mechanical difficulties. The low fuel and upkeep charges have resulted in a cost substantially below that of new sand, and the thorough cleaning and freedom from "fuzz" or "whiskers" makes it possible to effect still further economies in making up a new mix in the foundry, since less core oil is required.

Sand from the magnesium foundry was originally treated at a different temperature and rate of flow, and the equipment operated equally well. More recently, however, it has been found possible to give identical treatment to both aluminum and magnesium sands.

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For increased handling speed!
Because Transite Core Plates weigh so much less than metal, they are easily handled—thus speed production. Whether making castings of brass, aluminum, gray iron, malleable iron, or steel, here are some advantages Transite Core Plates provide:
Lightweight—Much lighter-than-metal, they handle easier . . . permit heavier loads.
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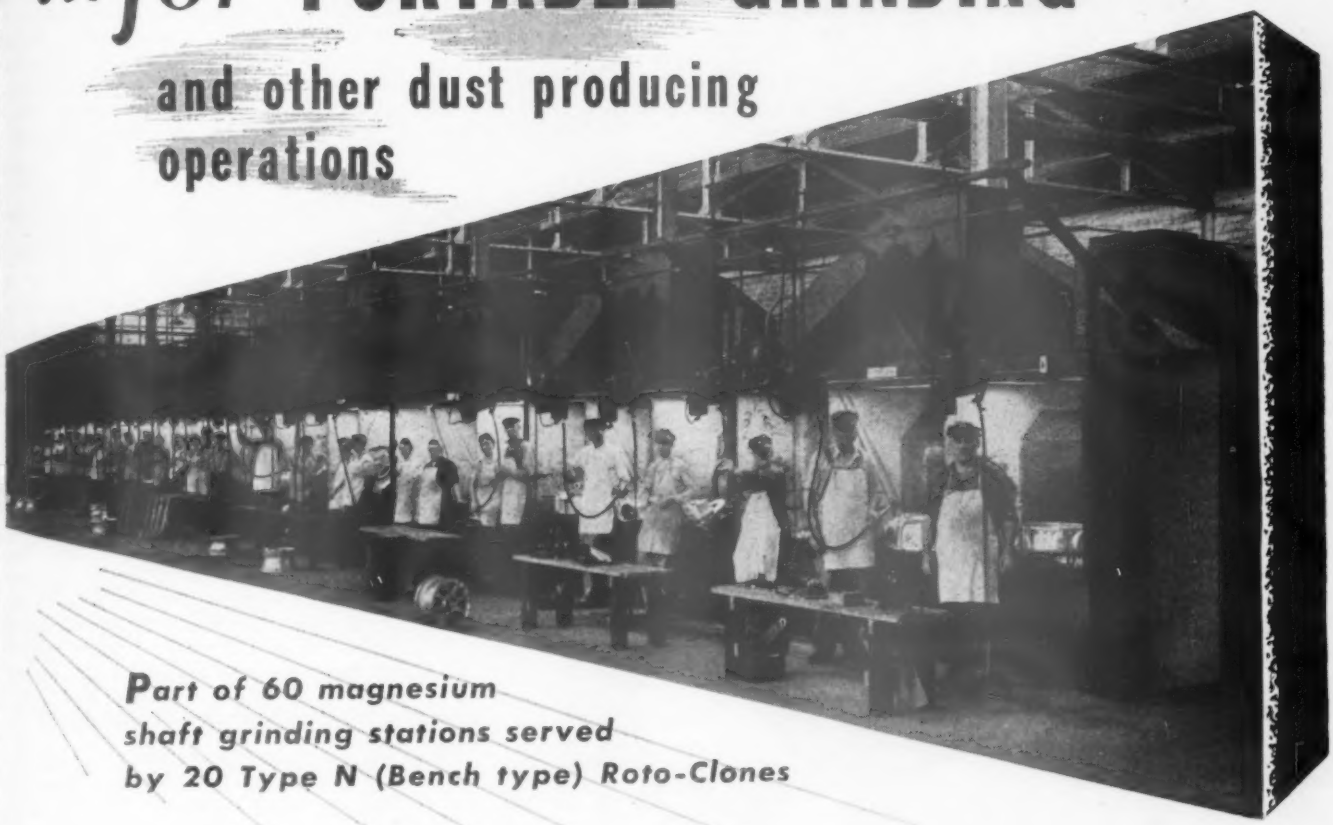
Lists Publications And Patents

Battelle Memorial Institute, Columbus 1, O., has published a 72-page catalog of publications and patents resulting from 15 years of research by that institution. It lists over 800 contributions, books and patents in the fields of metallurgy, ceramics, fuels, chemical engineering, organic chemistry, industrial physics, etc.

...*for* PORTABLE GRINDING

and other dust producing operations



Part of 60 magnesium shaft grinding stations served by 20 Type N (Bench type) Roto-Clones

Finely divided dusts produced by grinding and finishing operations on metal parts, plastics and other materials are particularly suited to collection by the Type N Roto-Clone. This wet-type dust precipitator is available in 2 forms—as a complete self-contained unit and as a ventilated bench (illustrated above). In this installation 3 grinding stations are served by each Roto-Clone—thus requiring a total of 20 dust collection units. These units exhaust an air volume of 120,000 C. F. M. which is recirculated clean to the workroom.

Send for Bulletin No. 277 for further information.

AMERICAN AIR FILTER CO., INC.
266 Central Avenue, Louisville 8, Kentucky
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TYPE N ROTO-CLONE

NEW MALLEABLE FOUNDRY IS MODERN

(*Continued from page* 88)

molten metal to the pouring stations where it is transferred to covered and insulated 250-pound capacity ladles. Close control is maintained throughout the melting schedule by pouring test specimens and bars every half-hour from the furnace metal. On all specimens starting with tapping, the carbon, silicon and manganese contents are determined.

Tensile test bars, placed in strategic locations with the charges going into the annealing ovens to undergo the same heat treating cycle, provide a check on physical properties and on correctness of the annealing operation. In addition to these bars, small square bars are cast and broken for fracture inspection.

Molding lines extend lengthwise with the building and are served by separate tray conveyors to carry finished molds to the pouring stations. The conveyors move continuously at a speed of about 20 fpm, and the pouring ladles are pushed along a monorail as the molds are filled.

The conveyors make a loop after passing the pouring platforms, and as they start in the reverse direction they enter hoods where exhaust fans draw off smoke and fumes from the molds. Just before reaching the opposite ends of the lines the conveyor trays are raised automatically on one side, and the poured molds are dumped onto a chute leading to the shakeout conveyors located below the floor.

The latter conveyors, one for each molding line, are trough-shaped and of the reciprocating type, with a slight slope which jogs the hot sand and castings along to a point opposite the sand handling equipment on the floor above. There the sand and castings are discharged onto a cross conveyor line of the same type which carries both to a vibrating shakeout. Sand drops through the screen to be returned by bucket conveyor to the sand system, while castings are discharged to an apron conveyor, which transports them up to the foundry floor. The tunnels in which the conveyors and shakeout are located are connected to a powerful exhaust system for the removal of dust, heat and smoke.

Castings Are Inspected

Approximately an hour elapses between pouring and the time that the castings reach the hard iron conveyor, when they are sufficiently cool to handle. Sprue is knocked off by workers stationed along the conveyors at floor level, and after a rough inspection, the castings are placed in steel tote boxes. Sprue remains on the conveyor and is dumped into steel buckets which, when filled, are attached to an overhead chain conveyor leading to the raw material yard where their contents become available for subsequent cupola charges.

Floor area in the center of the plant is occupied largely by the sand preparation and coremaking departments and core ovens. The sand system receives return sand from the shakeouts, passes it through magnetic and screen separators and elevates it to overhead storage bins. As required at the various molding lines the sand is mulled by a battery of four mixers and elevated to overhead belt conveyors, which carry it to individual hoppers located above each molding station.

Cores are made on the two top floors of a three-story structure located in approximately the center of the plant. Sand is prepared on the top floor by mechanical mixer and dumped through grating into the coremakers' hoppers on the floor below. Some cores are blown by machine, others being made by hand.

Pattern and machine shops are located along the south wall of the plant opposite the annealing department, and the second floor of this unit is devoted to pattern storage. The pattern shop is concerned principally with repairing the metal patterns used. The machine shop is engaged in maintenance rather than

(*Concluded on page* 228)

101

Grinding Questions Answered

By Allen Steele, Manager, Dayton Grinding Wheel Division
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It can be the sole binder in sharp sand alone, sharp sand and clay.

When so used, it dries quickly, cleans out readily and the burned core can be reused.

It is an ideal partner for oil: Lion Binder slightly increases the hot strength, greatly reduces baking time, maintains dry strength and cleans out as readily.

It works equally as well with Ground Pitch: Lion Binder in this case decreases the hot strength, decreases the baking time, maintains the dry strength and reduces clean out.

We have a booklet telling more about Lion Binder, and we have a staff of trained men who know how to use it under all foundry conditions.

J. S. McCORMICK CO.
PITTSBURGH, PA.

(*Concluded from page 226*)

production work.

Castings are annealed in car-type, elevated electric furnaces, the equipment consisting of 14 furnaces operated in pairs. One of each pair of furnaces operates at high temperature, the other at low temperature. Procedure with the two-furnace arrangement is to place the castings in the high temperature furnace and hold until all the carbon is in solution. Then the castings are removed and placed in the low temperature furnace for slow cooling through the critical range.

Smaller castings are placed in heat resistant, alloy steel baskets or boxes about 24 inches in diameter and 30 inches high for annealing while the larger castings are piled on cars in such a manner as to prevent warpage. Generally a car is loaded with baskets of small castings and the larger castings are stood on end between rows of the baskets.

Temperature of the ovens is controlled automatically by equipment in a structure containing the numerous transformers, meters and switch panels used to supply electric power to the ovens, with recording pyrometer equipment, relays and switches controlling the power input to the furnaces.

After annealing, the castings are cleaned, the procedure followed depending on the size of the castings. Smaller ones are cleaned in mechanical blasting units with metallic abrasive. To facilitate handling of castings into and out of these units the company has standardized steel tote boxes which are the same width as the blasting units.

Larger castings are hooked onto a conveyor chain and transported through a room type blasting unit for cleaning. Since some of these castings are intricately formed with deep pockets hard to reach with fixed blasting nozzles, one compartment of the cabinet is equipped with a movable screen and slot in one wall which can be raised and lowered to any position. As the intricate castings pass through the compartment, an operator on the outside thrusts a nozzle through the slot and sprays the abrasive to any desired point by moving the screen and nozzle.

Castings are ground to remove gate stubs, etc. on a row of heavy duty stand grinders or on three swing grinders, depending on the size and weight. One unusual feature of the cleaning department, and of the entire plant, is the complete absence of the ordinary overhead network of ducts leading from the various machines to some central dust collecting equipment. That does not mean that this important feature has been overlooked—but just that the ducts are located under the floor which not only gives the impression of freedom and airy spaciousness, but also eliminates a resting place for dust.

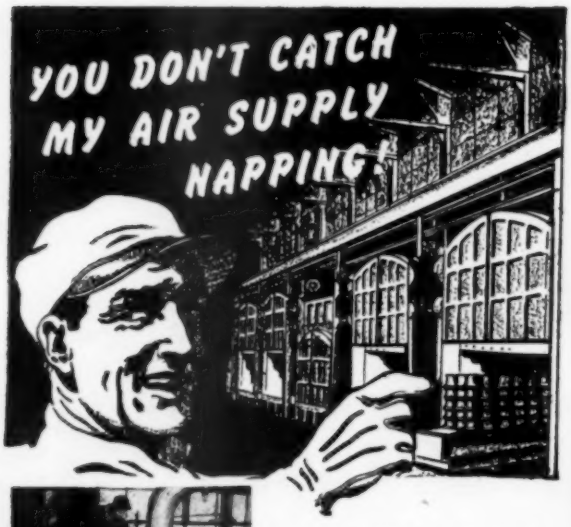
Equipped with Safety Devices

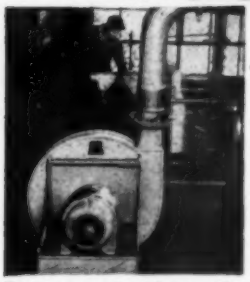
Castings that must meet dimensional and shape tolerances are straightened and coined on a series of hydraulic presses ranging in pressure capacities from 250 to 1000 tons. Type of press used depends on the size of the casting and the results desired. All presses are equipped with safety devices to prevent injury to the operators under all conditions.

The plant is so designed with complete conveyorized line production as to be entirely flexible for the production of both medium and small malleable castings regardless of end-uses, whether for war or peace. No reconversion problem will arise except that of replacing patterns which now produce castings for war with patterns of different designs, but of the same general character, for manufacturing castings which the same customers will use in their normal peacetime activities.

EDITOR'S NOTE: The new foundry facilities described in this article have attracted considerable attention from many foundrymen. As is the case with most foundries today, the company is at present handicapped through lack of manpower and therefore finds it particularly difficult to handle properly the visitors who are anxious to see the plant. For that reason the management suggests that plant visits be delayed until the present emergency is over and escorts, familiar with the organization and operation of the plant, are available.

Alloy Machine Corp., Elkhart, Ind., has acquired the machine shop and foundry facilities of the La Bour Co. Inc., that city.





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No matter how your furnace loads may vary, a Sturtevant Compressor is always on the job with a smooth supply of combustion air of the right volume and always with pressure held constant — *automatically*. That saves work, worry and money!

Furnaces operating under varying loads are often headaches when it comes to air supply. But not with a Sturtevant Compressor on the job. It makes possible *precision control* over furnace temperatures. This means better output —and more output.

Sturtevant Compressors keep air pressure *constant* over the whole volume range—*automatically*—although volume shifts nimbly to meet furnace loads. No ups or downs in pressure. No valves to adjust either. No attention except occasional lubrication. It's rugged and compact, with these plus advantages:

1. Wide clearances in the housing mean lifetime efficiency.
2. Overhung wheel design eliminates misalignment troubles.
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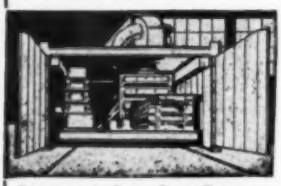
Sturtevant Cupola Blowers—assure smooth, constant pressure supply of air. Compact, simple, sturdy construction; sizes and types for all conditions.



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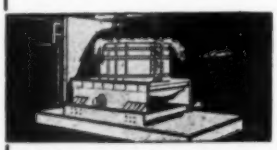
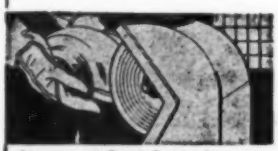


Sturtevant Foundry Shake-out Systems—effectively control dust and fumes, increase worker efficiency and equipment life, cut down maintenance.



Sturtevant Dust Control—pioneer experience in engineered systems for collecting dust from snagging, tumbling and sandblasting operations.

Sturtevant Fume Control—efficient tailor-made systems for production foundries or low-operating-cost equipment for jobbing shops.

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IBF TECHNICAL COMMITTEE'S WARTIME WORK

(*Concluded from page* 103)

Another piece of work carried out by the Technical Committee arising directly out of war conditions was the preparation, on the suggestion of the Ministry of Fuel, of a report on fuel economy. Here again a new subcommittee was appointed, all the members having special experience in the various branches of the foundry industry. This report[2], which was published in 1943, gives the committee's recommendations for securing the maximum efficiency from the use of fuel in all foundry processes and operations. All types of melting furnaces are covered including the cupola, air furnaces, rotary, crucible and electric furnaces. Other sections deal with sand, mold and core drying, heat treatment and the use of all power consuming equipment. The recommendations made have been endorsed by various other interested bodies and in order that the work of the committee should be of the maximum value to the government fuel efficiency campaign, a copy of the report has been sent to every foundry in the country.

Another report prepared by a specially appointed subcommittee is that of the Mechanical Development Subcommittee on "Mechanical Handling in the Foundry."[3] In this report an attempt was made to describe and discuss every type of mechanical handling equipment which may be used in the foundry from the receipt of raw materials to the despatch of the finished product. When presented at the annual meeting of the institute in 1944, the report evoked considerable discussion, which may be taken as a measure of the interest in this subject at the present time.

Quite apart from these additional activities of the Technical Committee, the work of the standing subcommittee has continued and in some cases increased. The number of reports issued has been well up to prewar standards and some of the subcommittees have rendered valuable service to the industry by acting in an advisory capacity to the Ministry of Supply in connection with production problems with various materials and assisting in the drafting of special wartime specifications.

Technical Committee Reorganized

In 1944, however, it was decided that the efficiency of the Technical Committee could be increased if it were reorganized on somewhat different lines. The original standing subcommittees were therefore dissolved and the full committee replaced by a smaller Technical Council. This council continues to deal with all the technical affairs of the institute. When any special problem arises in the industry on which investigational or other special work is required, the council appoints a subcommittee with clearly defined terms of reference to study this subject and report on it to them. It will be seen that this arrangement is very similar to that which was successfully adopted by the old Technical Committee in dealing with wartime problems. It has several advantages over the system of standing subcommittees in that it allows a greater proportion of members to serve on technical committees and prevents subcommittees from drifting into work for which their personnel is not particularly suited.

The new Technical Council has now been in existence for a year and under the chairmanship and guidance of P. A. Russell is making excellent progress. A number of new subcommittees have been appointed, and the speed and enthusiasm with which their work is being carried out suggests that the present arrangement will benefit both the institute and the industry.

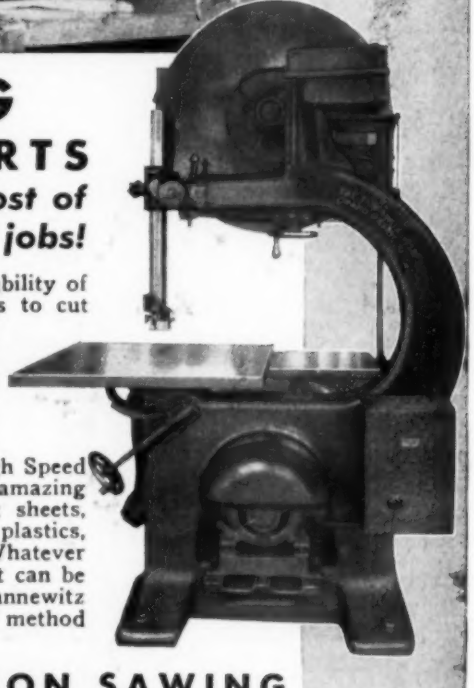
References

1. British Exchange paper to 1943 Annual Convention, AFA.
2. Institute of British Foundrymen Special Report No. 3.
3. *Proceedings* Institute of British Foundrymen Vol. 37, 1943-44.

Philadelphia Division of Yale & Towne Mfg. Co. has won the Army-Navy "E" for the third time.

The SUPER METHOD

of TRIMMING FORMED PARTS and performing a host of other metal cutting jobs!



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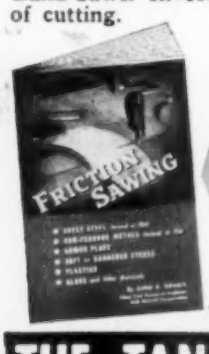

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Fewer REJECTS

There's a great deal of interest in *dry* core binders, as foundrymen plan post-war work. Reports from Houghton engineers indicate a keen interest in this war-born, proven method of making better cores.

Behind the individual assistance given foundries to assure the results we know can be obtained, are the fully equipped Houghton Laboratories, recently enlarged for core research. Hardness tester, Dilatometer, baking ovens, rammers, standard breaking test machines, extra large desiccators, core ovens, muller —everything needed to predict the performance of a binder will be found in our laboratory.

Dry core binders are an exclusive Houghton development, based on thermo-plastic resins. Use HY-TEN No. 100 for non-ferrous, HY-TEN No. 250 for gray iron and steel, and see for yourself why *dry* binders are being increasingly used by leading foundries. Write E. F. HOUGHTON & CO., 303 W. Lehigh Ave., Philadelphia.

HOUGHTON'S FOUNDRY RESEARCH HELPS MAKE BETTER CASTINGS

MOLDING LARGE CAST IRON CRANKSHAFTS

(*Continued from page* 89)

the cross section of the cores. Cores must be made from high hot strength, low permeability sand mixtures. These cores resist penetration but, through latent collapsibility, prevent normal shrinkage and indirectly are responsible for shrink areas and hot tears. To summarize briefly: Vertical pouring and cooling involves hazardous gating, unbalanced temperature of metal throughout the mold, with resulting reduction and variation in physical properties, unbalanced feeding in cored shafts, highly dangerous coring and expensive cleaning.

2—**Horizontal pouring and vertical cooling.** The prime objective of this method is fast, quiet introduction of metal into a horizontal mold. The mold then is raised to a vertical position as quickly as possible to obtain full benefit of head pressure, while the metal still is in the molten state. This method has a decided advantage over the first. Pouring speed can be greatly increased through elimination of the height factor, with consequent removal of erosion hazard. Traps and skimmers easily are incorporated in the gating system with virtual assurance of clean metal entering the mold. Down sprues must be placed at the extreme end of the mold, adjacent to or beyond the top of the shrink head to prevent a run-out after the mold is raised. A definite disadvantage is the necessity of having to flow the metal the complete length of the shaft, with resultant loss of temperature in the end of the shaft opposite the runner box.

The vertical cooling method is satisfactory in solid shafts of favorable design. As in the first method, it is unsatisfactory in cored shafts with rapid change of metal section and relatively short journals. Each throw is inclined to cool as an individual casting. The top throw reaps the benefit of the feeding head and is free from defect. Each succeeding throw to some extent feeds upon itself with consequent shrinkage or hot tears. With the mold in vertical position, the effect of ferrostatic pressure again becomes apparent on the bottom. High hot strength cores must be employed, with resulting hazards and disadvantages as shown in the first method. Horizontal pouring insures clean metal entering the mold; increases pouring speed and consequently promotes uniformity of metal temperature throughout the mold. To follow this with vertical cooling entails unbalanced feeding in cored shafts, dangerous coring and expensive cleaning.

3—**Horizontal pouring and horizontal cooling.** Prime objectives of this method include fast, quiet introduction of metal into the mold; distribution of metal from centrally located sprues to promote uniform temperature; uniform pressure throughout the length of the casting, whereby cooling conditions are balanced in all throws and thus insure uniform physical properties throughout the casting.

Since mold and casting are to remain in the horizontal position, pouring speed can be accelerated by placing runner box and down sprues at the center of the mold. From this point the metal is distributed in opposite directions through the runner system and into the mold cavity. In two identical shafts, one poured in a vertical and one in a horizontal position, the pouring time for the first was 55 seconds, and only 17 seconds for the other. Fast pouring minimizes reduction in temperature from progressive contact with the cold mold surface. This factor is very important in obtaining uniformly high physical properties.

Crankshafts of hollow design and relatively uniform section throughout can be cast horizontally without risers or shrinkheads provided that the diameter of the internal cores is at least 50 per cent of the outside diameter of the shaft and the metal section surrounding the cores does not exceed 2 in. Also, provided that the webs are designed to maintain approximately the same metal section as in the pins and journals. Where these con-

WORKING WITH ALUMINUM?

Typical layout for die casting, showing compact 20 KW Ajax-Tama-Wyatt furnace in position. Unit comes with complete control cubicle, as shown.

INVESTIGATE THIS UNIQUE HOLDING FURNACE for IMPROVED OPERATIONS and LOWERED COSTS!

INDUCTION FURNACES MEAN A MODERN PLANT..

In addition to the holding furnace here described, small, compact, twin-coil melting furnaces are likewise available for continuous production.

Rolling mills and foundries using Ajax-Tama-Wyatt units have *consistently* developed the highest physical properties in their aluminum products . . . with decreased gas absorption, absence of all segregation, and elimination of oxide inclusions and hard spots . . .

Clean-cut temperature control, great ease and simplicity of handling are operating characteristics. Ajax induction furnaces give you a modern plant, a cooler foundry, a better product. Significantly, too, they have been known to pay for themselves within less than six months. *Write for latest TW catalogs describing both Ajax holding and melting furnaces for aluminum!*

ADVANTAGES

- Every element of uncertainty is removed from holding furnace procedure
- Automatic, positive temperature control to within 5 degrees
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- Always ready to operate — no heating up or waiting periods
- Pays for itself quickly by doing away with pot or crucible replacements
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- Greatly improved overall foundry conditions inherent in induction melting

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AJAX METAL COMPANY, Non-Ferrous Ingot Metals and Alloys for Foundry Use
AJAX ELECTROTHERMIC CORP., Ajax-Northrup High Frequency Induction Furnaces
AJAX ELECTRIC CO., INC., The Ajax-Rodgers Electric Salt Bath Furnace
AJAX ELECTRIC FURNACE CORP., Ajax-Wyatt Industrial Furnaces for Melting

ASSOCIATE COMPANIES

ditions are not present, risers and shrinkheads must be used. Purpose of fast pouring is defeated to a great extent where open risers must be used, because of absence of pressure due to riser openings. In a mold with no outlets or openings, the metal is poured into what may be considered a vacuum. The filled mold receives full benefit of ferrostatic pressure exerted from the sprue and runner box height. In multi-throw shafts of extreme design, it is necessary to use large numbers of risers which add greatly to the cleaning cost. Blind or sealed risers have been used experimentally, but in most cases fail to give desirable results because their size definitely is limited and they tend only to radically increase section.

Balanced pressure on all parts of the horizontal mold, pressure divided over a much greater area, makes possible the use of relatively soft cores of high permeability and low hot strength. Naturally, these cores collapse rapidly and offer no resistance to contraction of the metal, thereby eliminating to a great extent the possibility of hot tears and abnormal contraction.

Method Offers Many Advantages

Horizontal pouring and cooling offer many advantages: 1—Fast pouring with minimum loss in temperature. 2—Balanced distribution of metal to all parts of the mold with little temperature variation. 3—Balanced pressure and balanced cooling throughout the entire mold with resultant uniform physical properties throughout the casting. 4—Collapsible cores which offer no resistance to contraction and normal shrinkage. 5—Economical production through higher yield percentage, simplicity of molding operation, and relatively simple cleaning due to absence of penetration.

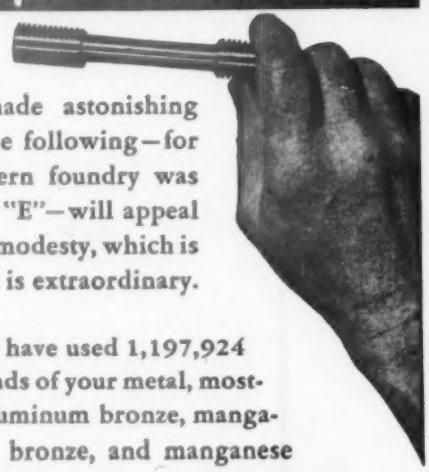
Regardless of how crankshafts are poured and cooled, production of sound castings is difficult where design presents rapid changes in angles, throw positions and metal sections. Experiments conducted during the past year have proved that where a shaft is cored out to present uniform metal sections in pins, webs and journals, the most serious casting hazards are eliminated. Also it has been proved that the best cooling conditions are obtained where cores are designed to follow lines parallel to the sections they hollow out.

For crankshafts with 7¼-in. diameter pins and journals the molds are rammed by speedslinger or bumper to insure uniform ramming in flasks specially designed to promote uniform cooling. A coarse grade of sand containing 18 per cent clay is employed. Moisture content is 6.5 per cent, green permeability 120, green compression strength 14 lb., and A. F. A. grain fineness 36. All surfaces of the mold exposed to metal are coated with graphite base blacking 40 Be. Molds are thoroughly oven dried and allowed to cool to room temperature before they are filled with metal. One coat of silica wash is applied to the face before the mold is assembled.

The gating system includes two 3-in. diameter down sprues feeding into a large catch basin, flanked at either end by skimmer cores designed to permit only 60 per cent of the sprue capacity to pass through. The catch basin effectively prevents any slag, eroded sand or other accidental foreign inclusions from passing beyond its confines. The basin is located at the exact center of the mold and the metal flows toward either end through a long runner extending the full length of the mold. From this main runner the metal flows through a number of gates into a second parallel runner much smaller than the first runner. Gates connecting the second runner with the mold cavity are spaced about 6 in. apart and are designed to minimize spouting. The metal enters the mold quietly. Pressure is built up progressively in the gating system from sprues to ingates.

Combined area of the connecting gates between the first and second runners is considerably less than the area of the first or outside runner which takes metal from the catch basin. Area of the second runner is considerably less than the combined area of the connecting gates, and the combined area of the gates is less than the area of the second or inner runner. By progressively decreasing dimensions from sprues to ingates, pressure

REJECTS BELOW 1/4 OF 1%!
A Highly Expert Foundryman reports to AJAX



Nonferrous founders have made astonishing records in the last 3 years. The following—for which this representative eastern foundry was thrice awarded the Army-Navy "E"—will appeal to all foundrymen because of its modesty, which is typical, though the achievement is extraordinary.

"We have used 1,197,924 pounds of your metal, mostly aluminum bronze, manganese bronze, and manganese aluminum bronze. All of this has gone into Army and Navy material. It has been subjected to severe tests, both chemical and physical, in castings weighing from ½ to 750 lb. each. A lot of this had to stand a hydrostatic test of 7,700 lb. On this production, we feel it safe to say that our rejects have been less than ¼ of 1% due first, to your fine quality of metal, and second, to our good luck."

We are always gratified to receive letters of this character, and take pleasure in placing it among many similar ones received during our 65 years in the metal business.

Send for booklet
"INGOT METALS OF TODAY"

16 STANDARD INGOT METALS BY AJAX
Ajax Tombasil
Ajax Plastic Bronze
Ajax Anti-Acid Bronze
Ajax Phosphor Bronze
Ajax Red Brass Ingots
Ajax Manganese Bronze
Ajax High-Tensile Manganese Bronze
Ajax Golden Glow Yellow Brass
Ajax Nickel-Copper 50-50%
Ajax-Hamilton Gear Bronze
Ajax Manganese Copper
Ajax Aluminum Alloys
Ajax Phosphor Copper
Ajax Silicon Copper
Ajax Nickel Alloys
Ajax Phosphor Tin

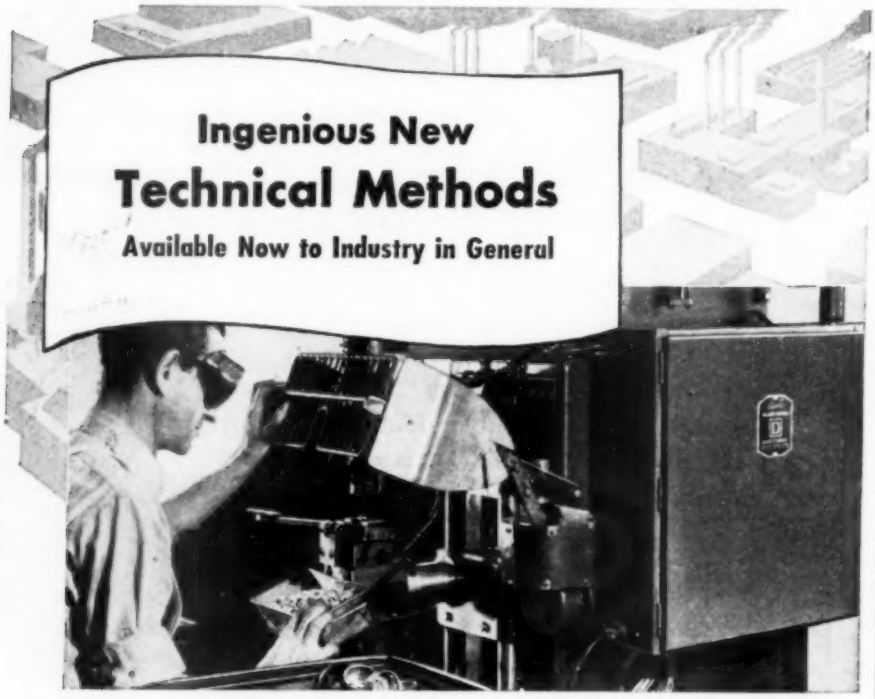
NOTE
"Proper Melting Decreases Foundry Losses," contains interesting data. Also, the booklet, "Nonferrous Ingot Metals of Today." Write for both of these. They are free.

AJAX NON-FERROUS INGOT METALS AND ALLOYS FOR FOUNDRIES
ESTABLISHED 1880
METAL COMPANY · PHILADELPHIA
AJAX ELECTRIC FURNACE CORP., Ajax-Wyatt Induction Furnaces for Melting
AJAX ELECTROTHERMIC CORP., Ajax-Northrup High Frequency Induction Furnaces
AJAX ELECTRIC CO., INC., The Ajax-Hultgren Electric Salt Bath Furnace
AJAX ENGINEERING CORP., Ajax-Tama-Wyatt Aluminum Melting Induction Furnaces
ASSOCIATE COMPANIES

is built up. Slag and other foreign inclusions have no chance of entering the mold.

Cores for these castings are made from a washed silica sand bonded with oil, 1 part oil to 80 parts sand. Properties include: Moisture 7 per cent, green permeability 140, dry permeability 255, dry shear strength 120 lb., dry tensile strength 130 lb., dry transverse strength 32 lb., A.F.A. grain fineness average 48. Core surfaces in contact with metal are coated with two coats of silica wash after drying, and cores are allowed to cool to room temperature before they are placed in the mold.

Basic importance of good design to sound foundry practice has been emphasized. The principle is not new. Understanding and co-operation of designing engineers always have been indispensable to any intelligent foundry operation. What is comparatively new in our experience is a means for accurately measuring the profound effect of good foundry design on the strength of the resulting casting. Research work on experimental stress analysis indicates that operating stresses which later will be imposed on the finished structure follow some of the same laws that govern the behavior of fluid metal in a mold. To a fascinating degree the design which is best from a foundry standpoint also is best for the distribution of operating stresses in a finished crankshaft. This efficient relationship gives casting a formidable position in competition with forging as a method of large crankshaft manufacture.



Now! Projection Welding of Two Studs to Housing in One Operation!

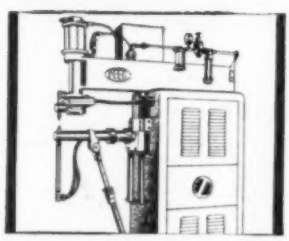
The series of P-20 Peer Welders were developed to provide manufacturers of sheet metal and wire products with automatically air operated machines capable of high speed precision projection and general spot welding. They are sturdily constructed, low priced, direct air operated, press type machines.

Shown above, is a Peer P-20 set up with safety guard which is so adjusted that, when lowered, it trips the switch and causes the welder to pass through a complete welding cycle before the machine automatically lifts the guard and stops, ready for the next operation. Other means such as a foot-switch control, can also be used to actuate the welding cycle.

The standard cylinders furnished with these welders provide nominal electrode force up to a maximum of 1000 lbs. Pressures are easily adjusted by the air pressure regulating valve. The welders may be operated with strokes suitable for work at hand within the range of from 0" to 3".

Shown at right, is the wrapper from a package of Wrigley's Spearmint Gum. This famous wrapper will remain empty until conditions permit Wrigley's Spearmint manufacture in quality and quantity for everyone. Wrigley's Spearmint Gum, will, one day, be back as "a help on the job" to workers in industry. Until then, we ask you to remember this wrapper as a guarantee of finest quality and flavor in chewing gum!

You can get complete information from Pier Equipment Mfg. Co., 8 Milton St., Benton Harbor, Mich.



Air Operated Press Type Spot Welder

Remember this wrapper

Z-82

DEVELOPMENTS IN RESEARCH WORK

(*Continued from page* 102)

of iron castings. Lectures were also given on behalf of various ministries to assist in spreading as rapidly as possible the knowledge required in connection with changes required to meet war conditions.

The association did a large amount of advisory work for member firms making products in cast and malleable cast iron, including practice shot, shell, H.E. bombs, smoke bombs, grenades, incendiary noses, fuze bodies, locomotive wheel centers, tank track links and bogie wheels, apart from the wide range of castings for engineering purposes required for the munitions program. The special applications of cast iron in such developments as crankshafts made notable progress and not only gave good service, but relieved bottlenecks in the production program. Workers on this side viewed with interest and with some envy the opportunities which workers in the United States had in the early years of the war to continue with their normal work and which led to such interesting developments as the acicular cast irons, the properties of which have been fully confirmed by the BCIRA and which have found applications in munition work.

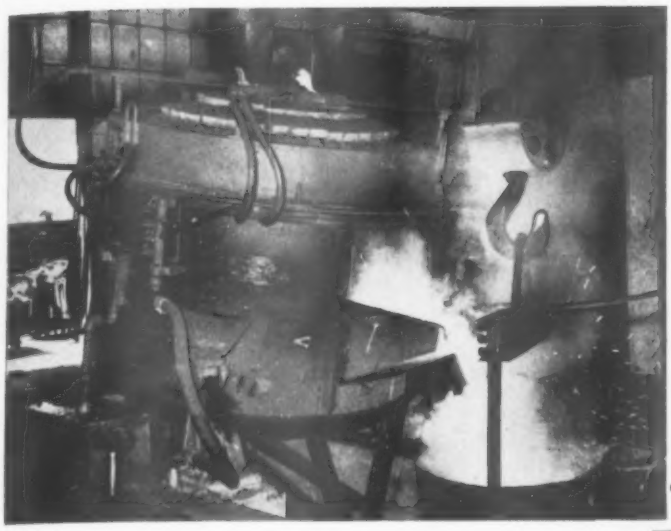
Dephosphorize Cast Iron

Among the experimental work undertaken, work was included relating to the dephosphorization of pig iron and scrap, arising from the necessity for using all low phosphorus material available for steelmaking; to substitutes for imported materials, such as clays, oxides used for vitreous enameling; and substitutes for imported material urgently required for other purposes, for example, linseed oil. Once the primary purpose was served, no attempt was made to press work to academic completeness, and a change in the situation—for example, the conquest of North Africa—or the increased availability of shipping space, would result in a change in the technical program. Scrap problems also required investigation. The conservation of alloying elements, the best possible use of alloy scrap available from other purposes, the use of borings and turnings, and the use of low grade materials also had attention; and the association carried out a series of investigations for the ministry

(*Concluded on page* 236)

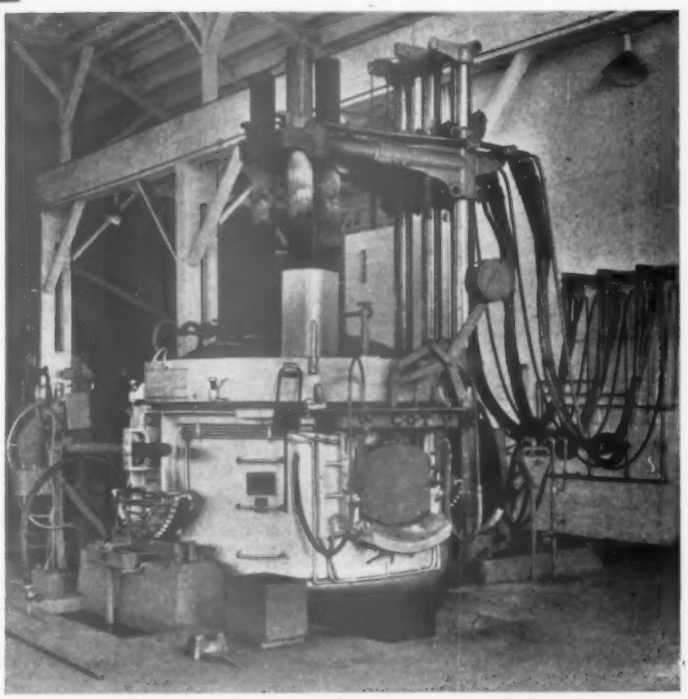
ANNOUNCING.....

IRONTON CARO-LINE



THE MONOLITHIC REFRACTORY LINING FOR ACID ELECTRIC FURNACE SIDEWALLS

Now you can have Rammed Sidewalls in your acid electric furnaces, made from a mixture of "Ironton Caro-Line" and grain sized ganister. It is quickly and easily installed with regular furnace helpers. Spalling is practically eliminated, the rammed lining is highly resistant to slags and it lasts considerably longer than ordinary silica linings. This is not an experiment—it has been used by several progressive steel foundries during the past year. Ask us for additional information on this important development.



THE IRONTON FIRE BRICK COMPANY

RELIABLE REFRACTORIES

IRONTON OHIO

(*Concluded from page 234*)

concerned arising out of the use of cast and malleable cast irons in armament work or relating to properties, production processes or defects arising in service.

Although at one time it appeared that great possibilities might follow from the use of vitreous enamel for certain purposes, on the whole this industry suffered severely, and experimental work on it by the association was shut down completely in 1943. There has been considerable development in the industry in the use of ladle graphitizers and in knowledge relating to their use. American developments in this direction have been followed with interest. In order to minimize transport hauls, a series of sand deposits suitable for coresands was examined so that Midland foundries could make use of them.

Naturally during this period there has been a considerable drop in the amount of material published, partly owing to censorship and partly owing to the absorption of the people concerned with war work, but it is hoped that when the immediate pressure is over it will be practicable to restore published work to, and discussion by, the scientific societies to something like its prewar level. Similar remarks apply to the restoration of freedom to travel, so that workers on this side may again have the opportunity both of visiting and receiving visits from their American friends. The possibilities of such interchange during the war have been extremely limited and there is a good deal of leeway to make up. In Great Britain a sad handicap has arisen as a consequence of the paper shortage which, judging by the size of American periodicals, has been much less acute in the United States. Here again, an opportunity for interchange has been cut down and owing to losses by enemy action, many institutions on this side have lamentable gaps in their files of American technical periodicals which they will be anxious to make good.

The Research Association itself has transferred to new premises which, it is hoped, will form the nucleus of a permanent national headquarters, which will be expanded as soon as building is possible after the war. With this in view, considerable additions have been made to research equipment. It is proposed to increase the work of the research department both on fundamental or basic work and also on work for specific industrial objectives. There will also be an active development department for the purpose of assisting member firms to apply the results obtained in the laboratories and to assist them in their day-to-day difficulties. These departments correspond with the creation and application of new knowledge. The remaining department, the intelligence department, will deal with its dissemination through the library and information bureau and publications. Among recent developments, a building uses department has been formed with a consulting architect in charge, which arranged an exhibition of building and domestic applications of cast iron towards the end of 1944. This has been so successful that a section of the development department has been organized to deal with engineering uses.

Regarded With Confidence

These indications of expansion will suffice to show that the future of ironfounding is regarded with a good deal of confidence, in spite of the threat arising from alternative materials like weldings and fabricated structures, plastics, light alloys, and the like, but the competition does imply that the ironfounder will have to recognize the fact that he is no longer engaged in selling a cheap product, but a material with certain definite properties which, for a number of applications, is unsurpassed and is unlikely to be displaced. By means of an aggressive research, development and manufacturing policy the area of these applications can be increased if the industry is raised to a new technical plane. It has very great assets in manufacturing from widely-occurring raw materials and it can give very quick deliveries. When the fullest advantages of continuous production and technical control are realized, the future of the industry should be assured.

There's a stock of

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From any one of the locations shown below . . . you can get prompt shipments of Schundler Bentonite . . . a first quality foundry Bentonite.

Akron, Ohio	Stoller Chemical Co.
Birmingham, Ala	Foundry Service Co.
Boston, Mass	Klein-Farris Co., Inc.
Buffalo, N. Y.	Weaver Materiel Service
Chattanooga, Tenn.	Ind. and Fdy. Equip. Co.
Chicago, Ill.	Foundry Supplies Co.
Chicago, Ill.	B. J. Steelman
Chicago, Ill.	Wehenn Abrasive Co.
Cincinnati, Ohio	Delhi Foundry Sand Co.
Coldwater, Mich.	The Foundries Materials Co.
Detroit, Mich.	The Foundries Materials Co.
Dallas, Texas	Barada & Page, Inc.
Edwardsville, Ill.	Midwest Foundry Supply Co.
Hammond, Ind.	The Foundries Materials Co.
Houston, Texas	Barada & Page, Inc.
Kansas City, Mo.	Barada & Page, Inc.
Long Island City, N.Y.	F. E. Schundler & Co., Inc.
Los Angeles, Calif.	Ind. Fdy. Supply Co.
Los Angeles, Calif.	F. E. Schundler Bentonite Co. (Inc. of California)
Milwaukee, Wis.	Thomas H. Gregg Co.
Minneapolis, Minn.	Smith-Sharpe Co.
Moline, Ill.	Marthens Company
New Orleans, La.	Barada & Page, Inc.
Oklahoma City, Okla.	Barada & Page, Inc.
Philadelphia, Pa.	Penna. Fdy. Sup. & Sand Co.
Portland, Ore.	Miller & Zehrung Chemical Co.
St. Louis, Mo.	Midwest Foundry Supply Co.
San Francisco, Calif.	Industrial Supply Co.
Seattle, Wash.	Carl F. Miller Co.
Tulsa, Okla.	Barada & Page, Inc.
Wichita, Kans.	Barada & Page, Inc.
Mexico D. F., Mexico	N. S. Covacevich
Montreal, Quebec, Canada— (All Provinces)	Canadian Industries, Ltd.

F. E. SCHUNDLER & CO., INC.
520 RAILROAD STREET • JOLIET, ILLINOIS

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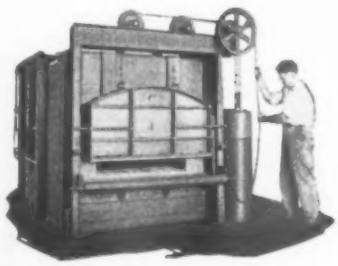
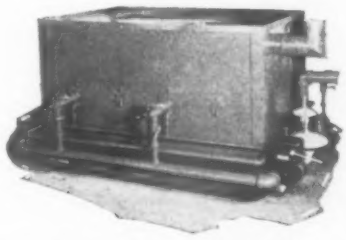
Uniform Heat Treating of Steel Parts

40,000 lbs. Per Load

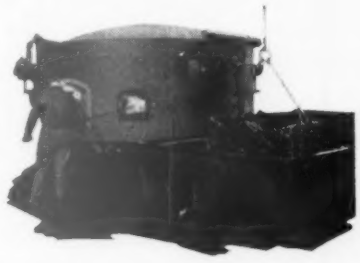
This oil-fired Radiant convection recirculating car type furnace holds 40,000 lbs. of fabricated steel parts and raises them to 1150° F. at a rate of 6000 lbs. per hour. It holds this temperature to plus or minus of 5° F. Sand sealed throughout including the door, this furnace is practically leak-proof. Distributed by ducts, flue gases blow across the heating chamber from wall to wall, thus bathing the entire charge uniformly. Convection furnaces are built and guaranteed by us up to 1700° F. Radiant Combustion tailor-made furnaces, designed to definite specifications, will increase production and efficiency in your heat treating department. Write for information.



BOX TYPE FURNACE heats 2′x3′x 7′ steel plates. Combination oil or gas fired, even temperature, heavy construction for long life. Hearth area is 3′ x 8′.



RECTANGULAR LEAD POT, annealing 75mm. shot, production 100 shells per hour, 42″ long x 18″ wide x 14″ deep inside. Constructed of 3/4″ steel plate. 1250° F. temperature. Hood and flueing not pictured.



ROTARY TYPE, 10 ft. hearth, four oil burners, operates at 1650° F., heat treats 2000 lbs. of steel per hour. Smooth operating due to special hearth mechanism. Six of these now operate in one plant.

Radiant Combustion, Inc

BUILDERS OF EVERY TYPE (OIL, GAS, ELECTRIC) OF HEAT TREATING FURNACE

WARREN, OHIO

WASHINGTON *Notes* ★★★

REGARDLESS of the steps already taken by government and those still ahead to ease the shock of total reconversion, it seems obvious that end of the war is bound to bring a period of sputtering in the industrial machine. While it is true that munitions production had been cut back steadily for a number of months and recently was at a rate approximately 20 per cent below that of the March quarter, it still represented some $4 billion per month. And this is no small amount of business to be withdrawn suddenly, especially since some industries must do considerable retooling before they will be able to substitute a similar volume of civilian goods production for the war orders they have lost through the end of hostilities.

* * *

At the same time, the Senate committee recommendation that one agency be given the overall authority in matters affecting reconversion represents a sound move if it will permit cutting the red tape which otherwise may prevail through conflicts between existing individual agencies. Without minimizing the inflationary dangers inherent in too rapid and too general lifting of price controls, various observers for some time have pointed to the possibility of a reconversion bottleneck should civilian goods prices be fixed at unrealistically low levels. If the Office of War Mobilization and Reconversion can resolve differences between WPB and OPA and strike the best balance between production and prices it can make an important contribution to the changeover to a peacetime economy.

* * *

ALL THE advance planning imaginable could not prevent at least a brief postwar period of hesitation and unemployment—so long as the war was to end more abruptly than appeared probable a few months ago—but it seems a safe bet that the fears of the worst pessimists will not be realized. American ingenuity in tooling and producing for war not only confounded the enemy but bettered most expectations at home. That same skill should prove equal to the task of industry in retracing its steps quickly to production for peace.

* * *

For most branches of the foundry industry reconversion will be relatively painless in that a sizeable demand for civilian products is waiting to be filled and comparatively little rearrangement of plants will be necessary. Producers of aluminum and magnesium castings probably will be the hardest hit by war contract cancellations, although in both instances a production higher than prewar levels is in early prospect. With numerous other industries also able to reconvert promptly—including steel and the majority of other producers of raw materials—the temporary unemployment that will develop in industry will be most serious among the manufacturers of finished goods.

* * *

NOBODY knows how long certain price controls will remain in effect, but the major cost-of-living items probably will be held under ceilings for some time. OPA has the power to remove controls in less important fields subject to reinstatement should they be necessary. The procedure outlined in a recent directive by the Office of Economic Stabilization is that ceilings may be lifted when the OPA director feels the action will not result in an increase in the general level of prices of the item involved. Should the commodity enter significantly into the cost of living the ending of price control may be disapproved by the Director of Economic Stabilization. In all of the latter cases exemption must be preceded by a trial period of suspension.

(*Concluded on page 240*)

SAHARA
AND
REXALL

These belts will perform economically for you as they have for hundreds of other foundries.

They are specially treated for the service recommended:

SAHARA—For hot sand.

REXALL—For cold sand and castings.

Prompt Service.
Pre-war Quality.

These brands are standard with some of your friends in the industry—Write us for some references in your locality.

IMPERIAL BELTING COMPANY
1750 S. KILBOURN CHICAGO 23, ILL.

Abrasive Dust

LIKE THIS

Microphoto of dust particles, magnified many hundreds of times. The irregular, sharp corners of these minute, metallic atoms, released by the millions in grinding, burring, and buffing operations, can do irreparable damage to both workmen and work unless effectively controlled.

Is* AUTOMATICALLY *withdrawn from working areas and* DEPOSITED UNDER WATER *with the

MAHON *Hydro-Foam* DUST COLLECTOR

Effective dust control must do more than remove dust from the zone of operation—*it must eliminate the dust after collection.* The Mahon *Hydro-Foam* process DOES BOTH. The millions of destructive dust particles, produced in grinding, buffing and burring operations, AUTOMATICALLY are whisked away from working areas and carried on an air stream directly to the collection unit. Here the air stream passes through a *patented* foam bath—even the finer dust particles are trapped in this bed of foam and submerged UNDER WATER in the sludge tank, located in the base. Under water, dust is out of circulation, *permanently*.

Hundreds of manufacturers, in scores of different industries, will verify the thoroughness, economy and safety of the Mahon system of dust elimination. Your request for complete and comprehensive information will receive immediate attention.

Mahon *Hydro-Foam* Dust Collectors are manufactured in standard units of various capacities which can be used singly or in multiple to meet any requirement.

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Designers and Manufacturers of Metal Cleaning Machines, Rust Proofing Machines, Hydro-Filter Spray Booths, Ovens of All Types, Filtered Air Supply Systems, Hydro-Foam Dust Collectors—and Many Other Units of Special Production Equipment—Including Complete Finishing Systems.

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STEEL • MALLEABLE
GRAY IRON
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PRACTICAL FOUNDRY ENGINEERS

4040 BOARD OF TRADE BLDG. — PHONE WABASH 3550
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ERIE BUCKETS

THE COMPLETE LINE

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Above types built in weights and capacities to suit your crane and job requirements.

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ERIE STEEL CONSTRUCTION CO.
ERIE, PENNSYLVANIA
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(*Concluded from page 238*)

Recent price actions by OPA include an increase of 40 cents a ton in the ceiling on by-product coke, effective Aug. 7, and a boost in copper alloy scrap. The latter permits sellers to add a special use premium of 1¼ cents per pound to base maximum prices when the scrap is prepared to meet the specifications of certain qualified consumers and is sold suitable for their direct use without further preparation.

• • •

SCHEDULES of stop-work points for certain iron and steel products have been issued by WPB and the Office of Contract Settlement. These represent stages to which fabrication or processing can best be carried in the event of contract cancellation. In the case of ferrous castings the proposal is as follows: If materials have not been charged in cupola or melting furnace, hold in raw material form. If materials have been charged or are in the process of being melted the heat may be cast. If castings are in any stage of furnace treatment, such stage may be completed. If castings are in any subsequent stage of cleaning, grinding, rough machining not beyond normal foundry practice, etc., the stage then in process may be completed.

• • •

War Manpower Commission has published a new "Directory of Labor Market Areas," available through the Superintendent of Public Documents, Washington, for 25 cents a copy. The directory lists all communities of 1000 or more, as of June 1, within WMC's 301 classified labor market areas. Communities are listed according to states, with maps showing area locations and boundaries by means of maps. Information concerning population and leading industries of the areas also is given.

W. G. G.

Seek Young Men For Foundry Industry

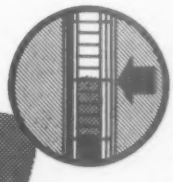
The Manchester & District Ironfounders' Association, 90 Deansgate, Manchester, England, recently has published an interesting booklet entitled "The Foundry Industry and Your Career." The foreword to the book states that it is given to the young man to encourage him to enter the foundry industry, since that industry needs a large number of boys of good education who are keen to take up a progressive career where their capabilities may be used to the full. The illustrations and text are intended to give the young man as complete a picture as possible of the industry, what it is, what it does and what it offers.

The text is well written and the illustrations are well chosen. The booklet should be of considerable assistance in attracting the right type of young man for foundry work. A similar pamphlet could be utilized to distinct advantage in the United States.

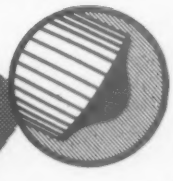
Does Not Retard Normal Drying of Standard Pattern Coatings. In cooperation with a nationally-known chemical company, we have developed a new and revolutionary composition for Master Wax Fillet. It permits *hard-drying* of standard pattern coatings. No more soft fillet surfaces to pick up sand and hinder production. No other make of fillet has this exclusive formula to assure normal coating drying—now available to you in Master Wax Fillet *at no extra cost!*

Great News

about important MASTER Wax Fillet improvements for *The* PATTERN SHOP



Melting Point Increased. Master Wax Fillet now stays harder longer, under higher temperatures—another new feature *at no extra cost!*



Improved Exclusive Shape. A more desirable shape has been developed for Master Wax Fillet, permitting easier application without any noticeable surplus when used in 90 degree or slightly obtuse corners. Another extra value *at no extra cost!*

Better Adhesion. Master Wax Fillet sticks tighter, longer, under more extreme temperatures and working conditions. *More* worth for your fillet money, *at no extra cost!*

Will Not Dry Out or Deteriorate. Regardless of your shop conditions or length of time you keep it, Master Wax Fillet stays flexible. More extra value *at no extra cost.*

Precision Made. Master Wax Fillet is made with highly accurate dies, to extremely close tolerances, and is always uniform. Again, better value *at no extra cost!*

Master Wax Fillet is available in convenient 1 pound rolls and 2 pound boxes. Write for advantageous prices and discounts on standard packages.

ALL These Advantages Now Available in Master Sheet Wax Also! To get more and better performance from your pattern shop, order Master Wax Fillet—the *only* fillet that provides all these *extra values at no extra cost!* Master Wax Fillet is the product of 25 years of experience.

For prompt service send your order direct to

ORDER FACTORY-FRESH STOCK DIRECT FROM US!

THE KINDT-COLLINS CO.

Everything For The Pattern Shop

12651 ELMWOOD AVE. • CLEVELAND 11, OHIO

KINDT-COLLINS MASTER PRODUCTS

NEW EQUIPMENT and SUPPLIES

(1)—Safety Glove: American Optical Co., Southbridge, Mass., announces a new safety glove made from high grade chrome-tanned cowhide. Principal feature is its one-piece back construction, which eliminates seams likely to catch sparks or molten metal. The style of manufacture reduces the number of seams to a minimum, and to give added strength and protection all vulnerable seams are welted.

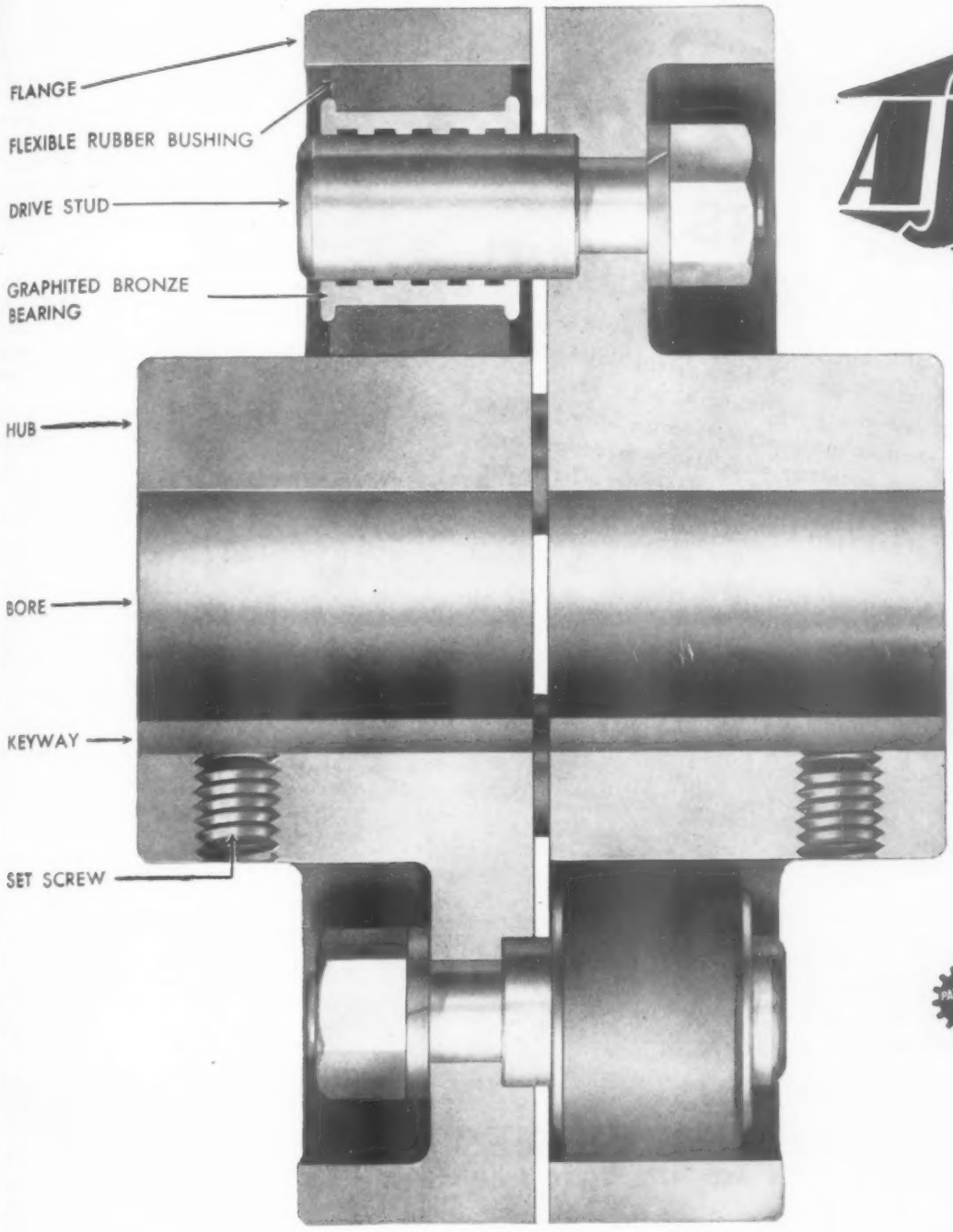
(2)—Centrifugal Casting: Centrifugal Machine & Engineering Co., 659 Jackson Court, Kalamazoo 7, Mich., is introducing a new centrifugal casting machine incorporating a heat-free hub bearing area, 18-in. diameter table mounting plate and a 20 x 24 in. heavy plate base. Two antifriction bearings are employed in the hub, which is designed to hold the temperature in the bearing area no higher than 125 F during continuous operation. The table has four strut vanes which act as a fan to remove excess heat radiated above the top bearing and which also provide support to prevent table distortion. Two-speed and variable-speed machines are obtainable. Equipped with certain mechanical drives, infinitely variable speeds are provided between 198 and 1290 rpm with a 2 hp motor, or 301 to 1959 rpm with a 3 hp motor. The protective hood and spill pan are made of 10 gage steel in a 25-in. diameter on the model shown.

(3)—Floor Plate Deck: Factory Service Co., 4615 North 21st St., Milwaukee 9, Wis., has applied a non-skid floor plate to its standard transport chassis. The plate is welded flush with the top of the chassis on the angles of the frame and is reinforced on the under side by two heavy angles. This type of surface keeps metal parts from "walking" off easily when the unit is in motion. Further, the embossments provide point contact with hot materials which allows some air space between them and the steel deck, thereby eliminating warping. The unit can be moved by the hand jimmy shown here, power lift truck, crane, tractor or conveyor.

(4)—Vertical Grinder: Master Tool Co. Inc., 5605 Herman Ave., Cleveland 2, O., has put on the market a new vertical, pneumatic grinder suitable for various types of work, including general grinding on large and small castings and heavy surface grinding, sanding and polishing of cast parts. Low overall height and handles close to the guard give excellent balance and close control over the work. Handles are separate parts and easily replaced. Large strainer in the air intake handle, easily removed for cleaning, keeps dirt out of working parts. An automatic lubricator provides a continuous flow of atomized oil to the complete tool. All major wearing parts are chrome plated to give longer life.

Industrial Wheels: Hutton Wheel Corp., 5569 Pershing, St. Louis 12, Mo., is offering a line of industrial wheels with pneumatic and cushion rubber tires, in sizes from 6 to 16 in. diam. Hub castings are rugged one-piece high grade cast iron with roller bearings and grease gun fittings. All wheels are precision machined and fitted with roller bearings and washers.

Heat Treater: Mahr Mfg. Co., division of Diamond Iron Works Inc., 1709 North Second St., Minneapolis 11,
(*Continued on page* 244)



AJAX

Incorporated 1920

PATENTS MAKE JOBS

THE INSIDE STORY OF AJAX FLEXIBLE COUPLINGS

Ajax Flexible Couplings protect direct connected machines from unavoidable misalignment. They require no lubrication. They are quiet running — no backlash, no noise. They provide free end-float which permits electric machinery to find its magnetic center. They operate satisfactorily in abrasive-laden air.

They are built in a wide range of sizes and capacities with standard couplings *made of forged steel or cast semi-steel.*

For special requirements flanges can be machined from aluminum, bronze or other metals, and can be plated with chrome, silver or cadmium for protection against adverse atmospheric conditions. Thousands of cadmium-plated Ajax Couplings are running on U. S. Navy equipment throughout the world.

Ajax Couplings can easily be made integral with brake drums, pulleys, fly wheels, etc.

Write for new catalog giving complete data.

AJAX FLEXIBLE COUPLING CO. INC.

WESTFIELD, N. Y.

Modern Design...
MEANS FUTURE ECONOMY!

The modernity of design and layout in your plant or plant expansion project will definitely be a determining factor in the success of your enterprise. The A. A. WICKLAND & Co. has devoted nearly a quarter-century to the solving of the many and varied problems associated with design, construction and operation of modern foundries. Our highly trained staff of engineers is always at your service and will be happy to assist you with any design or construction problems you may encounter. Write or telephone us today!

FOUNDRY ENGINEERS SINCE 1919

A. A. WICKLAND & CO.

ENGINEERING BUILDING • CHICAGO (6)

TELEPHONE DEARBORN 9344

ESTABLISHED 1905 — **Strand** FLEXIBLE SHAFTS — FORTIETH YEAR 1945

HIGH QUALITY

FLEXIBLE SHAFT MACHINES

ONE HUNDRED TWENTY-FIVE TYPES AND SIZES, 1/8 TO 3 H. P.

HORIZONTAL AND VERTICAL

THREE SPEEDS OR SINGLE SPEED

MORE THAN THREE HUNDRED ATTACHMENTS.

•

SEND FOR CATALOG NO. 29

THE LARGEST LINE IN THE WORLD

•

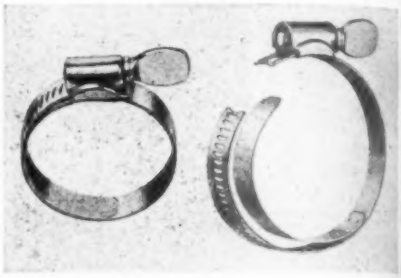
N. A. STRAND AND COMPANY

5001-5009 NO. WOLCOTT AVE. — CHICAGO 40, ILL.

(*Continued from page* 242)

Minn., is now in production on an electric unit for heat treating processes to 2000 F. Built in standard overall sizes up to 54 x 102 x 88 in., the units harden carbon and alloy steels to 1850 F, temper heat treated parts, anneal, normalize or preheat high speed steels. It is also suitable for experimental work, and is available with or without protective atmosphere.

Hose Clamp: Wittek Mfg. Co., Chicago 23, announces an improved worm drive hose clamp containing an inner band of stainless steel which protects the



hose from the serrations in the outer band and distributes the load uniformly to provide greater strength and superior sealing characteristics. The clamp has compact streamlined housing and hardened one-piece thumbscrew, and is available in eight adjustable sizes to cover the entire range of applications.

Finisher: Master Specialty Co., 5700 Cedar Ave., Minneapolis 7, Minn., is introducing an abrasive tool capable of accommodating six 12-in. abrasive strips at one time. When outside strip is worn, it can be quickly replaced and

tightened in place by a knob on the handle. The tool is useful for removing flash from plastic parts, smoothing and polishing of hardened tools and dies, deburring intricate stampings, or removing file and grinder marks from castings.

Centrifugal Pumps: Logansport Machine Co. Inc., Logansport, Ind., announces an improved line of centrifugal coolant pumps, equipped with integral motor drive, in foot mounted, bracket mounted, flange mounted, grinder and submerged types. An open impeller eliminatees the need for close clearances or metal-to-metal contact of running parts,

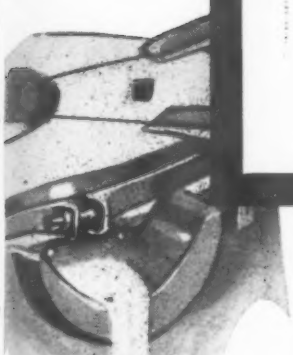
(*Continued on page* 246)

Quicker, Better-Quality Melting

PLUS MANY OTHER SUPERIOR-PERFORMANCE ADVANTAGES

McKee Eclipse Hand Tilting

CRUCIBLE MELTING FURNACES



McKee-Eclipse "HT" MUFFLE TYPE FURNACE

Widely used in melting aluminum. Also available in Semi-Muffle and Open Type.

QUICKER, BETTER-QUALITY MELTING

due to gas-firing under scientifically correct combustion conditions.

+

LOWER COST MELTING

+

EASIER TILTING

+

MINIMUM MAINTENANCE

+

LONGER FURNACE LIFE

In the melting of non-ferrous metals and alloys, exceptional success is being secured with these McKee-Eclipse Hand Tilting Furnaces, because of their special design features.

Among these features are (1) An exceptionally rigid, non-distorting furnace shell support; (2) Easy-operating hand-tilt mechanism; (3) Gas-firing with correct air-gas ratio maintained with a McKee Low-Pressure Proportional Mixer. For full details send for Bulletin C-6.

ECLIPSE FUEL ENGINEERING CO.
725 South Main, Rockford, Illinois.

McKee Eclipse

ECLIPSE FUEL ENGINEERING COMPANY

Soft metal Furnaces • Oven Furnaces • Forge Furnaces • Rivet Heaters • Aluminum & Magnesium Furnaces

"If it's for Gas—buy Eclipse"

Salt & Lead Pot Furnaces
Soldering Furnaces
Tank Heaters

CONCO CRANES FOR FOUNDRIES

The ideal foundry crane—compact, strong, easily and quickly operated. Throughout the country foundries large and small—having important war contracts—are using this Conco Low-Headroom-High Hook Lift Crane. With many outstanding construction features, it is designed to meet the needs of today. Write us for complete information.

CONCO ENGINEERING WORKS
DIVISION OF H. D. CONKEY AND COMPANY
19 GROVE STREET — MENDOTA, ILLINOIS

SPEAKING OF CORE EQUIPMENT

SOAK 'EM CLEAN WITH TAMMS NO. 100

TAMMS No. 100 "LIQUID" CLEANER

AUNT TAMMY SAYS: Why waste valuable time scouring and scraping metal core boxes, drier plates, blow plates, core vents and metal match plates—when all you need do is soak 'em clean! TAMMS No. 100 is fast acting—even cleans in the corners and crevices. Won't harm metal! Why not use this TAMMS method of keeping your metal match plates and core equipment in perfect condition? Order today!

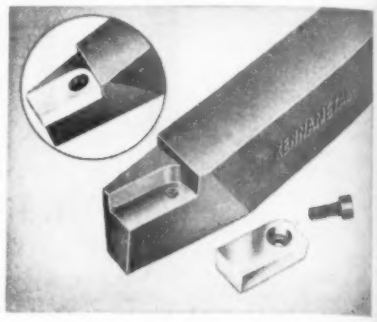
TAMMS SILICA COMPANY
228 N. La Salle St., Chicago 1, Ill.

Write for information on TAMASTONE Pattern Compound and other Foundry Specialties!

(*Continued from page 244*)

and allows pumping of liquids containing abrasives, filings and other foreign matter without damage to the pump. The totally enclosed ball-bearing type of motor used is completely protected against splashing liquids, and harmful foreign elements.

Tool Blank: Kennametal Inc., Latrobe, Pa., has developed a new type of tool blank having a drilled and counterbored hole to provide for attachment



to steel shank by means of a recessed-head cap screw. The angularly-set screw serves merely to hold the tip against the recess walls, which resist the main cutting thrusts. Complete tools of various styles can be furnished with the screwed-on tips, or separate standard blanks will be supplied to those who wish to make their own tools.

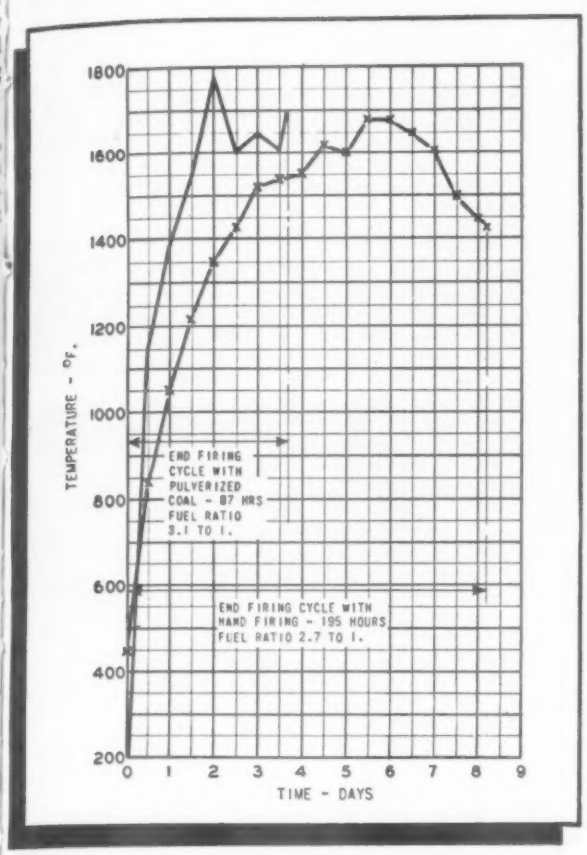
Welder's Truck: Palmer-Shile Co., 7136 West Jefferson avenue, Detroit 17, is offering a truck for expediting transportation of welder's equipment. The all-metal truck shown in the accompanying illustration has a frame work of angle iron and sheet metal, with handles of heavy tubular steel. Overall

height is 48 inches, width 29 inches, wheels are 24 by 2 inches. Features include a truck cradle to accommodate one gas and one air cylinder, truck handles equipped with cross bar on which torch hanger may be mounted, hooks welded on handles to provide a convenient place for hanging gas hose when not in use, and a tool box mounted on swivels to keep tools in a level position.

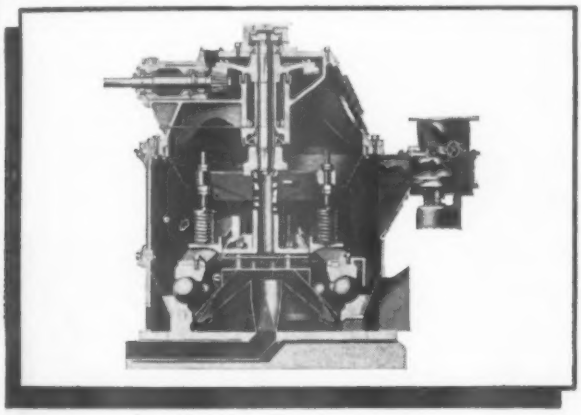
Belt Dressing—Graton & Knight

(*Continued on page 248*)

56% Faster Annealing with Less Coal


TEMPERATURE - °F.
TIME - DAYS
END FIRING CYCLE WITH PULVERIZED COAL - 87 HRS FUEL RATIO 3.1 TO 1.
END FIRING CYCLE WITH HAND FIRING - 195 HOURS FUEL RATIO 2.7 TO 1.

Time-temperature curves showing time saving of pulverized-coal firing over hand-firing 30-ton malleable-iron annealing furnace.



B&W Type B Pulverizer as arranged for supplying coal to circulating systems for firing metallurgical furnaces.

By changing from hand-firing to direct pulverized-coal firing with the B&W Circulating System, firing time on five malleable iron annealing furnaces was reduced 56 per cent. Furnace output, in tons of castings annealed per ton of coal, jumped from 2.7 to 3.1.

ONE pulverizer serves all five furnaces through a single pulverized-coal circulating line that is looped overhead, out of the way. This simple arrangement of the B&W system eliminates multiple piping and coal-handling equipment necessary for direct firing individual furnaces, keeps floor space around the furnaces clear for product handling, and effects substantial economies in installation maintenance.

Flexibility in multi-furnace operation is obtained by providing as many take-offs to burners as required, and because burners may be turned on or off as desired. Furnace temperatures are controlled easily, by methods similar to those used with gas and oil firing.

Results from this installation have been so satisfactory, from both operating and economy standpoints, that a second B&W system of the same type has been planned to fire six other annealing furnaces in the same plant.

For detailed data on this simplified system of pulverized-coal firing for metallurgical furnaces, write for Bulletin 3-365.

Water-Tube Boilers, for Stationary Power Plants, for Marine Service . . . Water-Cooled Furnaces . . . Superheaters . . . Economizers . . . Air Heaters . . . Pulverized-Coal Equipment . . . Chain-Grate Stokers . . . Oil, Gas and Multifuel Burners . . . Seamless and Welded Tubes and Pipe . . . Refractories . . . Process Equipment.

BABCOCK & WILCOX

THE BABCOCK & WILCOX CO.
85 LIBERTY STREET, NEW YORK 6, N.Y.

PM-106

DEOXIDIZING ALUMINUM

NOTCH BARS
SHOT
SHAPES

TRADE **CEMCO EY-BARS** MARK

THE CLEVELAND ELECTRO METALS CO.

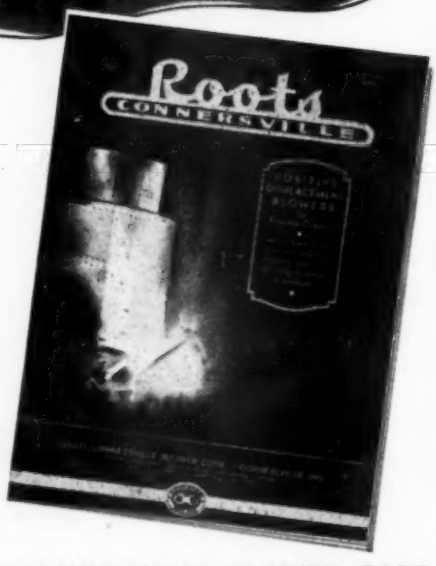
CLEVELAND 13, OHIO

MEMBER — ALUMINUM RESEARCH INSTITUTE

Do you want to Improve CUPOLA PERFORMANCE?

BULLETIN 22-B-12
points the way

It explains the advantages that are possible thru the ability of "R-C" Rotary Positive Blowers to build up pressures to overcome the maximum resistance encountered in your cupolas, as well as the ability to deliver, economically, the correct volume of air to meet any condition. Your request will bring a copy by return mail. Ask for it now.



Roots CONNERSVILLE SINCE 1854

ROOTS-CONNERSVILLE BLOWER CORP.
One of the Dresser Industries
501 Madison Ave., Connersville, Indiana

Rotary Positive **CUPOLA BLOWERS**

(*Continued from page* 246)

Co., Worcester 4, Mass., has developed a new formula liquid belt dressing which is said to produce an instantaneous power rise. Repeated tests show an improvement of 15 to 20 per cent increase in transmission from rating upwards, with a greater percentage rise for belts which are pulling under their rating. Regular use of the dressing, which contains no pitch or resinous materials harmful to belting, keeps the belting pliable.

Amplifier: Allied Radio Corp., 833 West Jackson boulevard, Chicago is featuring a powerful, all-purpose amplifying system which delivers a full 60 watts of undistorted output. The amplifier includes such features as four in-

dividually controlled microphone channels, two individually controlled phono channels, universal output for matching any arrangement of speakers, individual controls for high and low frequencies, etc. The amplifier, ideal for industrial paging in plants and large offices, is available separately or with any combination of speakers and microphones.

Goggle Cleaner— Allen Optical Co., 15-17 Allen St., Buffalo 2, N. Y., announces a goggle station for industrial use, designed especially for applying a new spray cleaner which eliminates fog and moisture from cloudy gog-

gles. Pushbutton control releases a predetermined amount of spray mist, pressure being provided by connecting to the plant air line. Additional spray is available for refilling quart container in the cabinet, in 1 and 5 gallon amounts.

Fluorescent Lamps: General Luminescent Corp., 638 Federal street,

(*Continued on page* 250)

AO

DURALITE GOGGLES *Give All-Round Protection and Comfort*

INDIVIDUAL EYECUPS
Anatomically designed . . .
Rounded edges for Comfort . . .
Low-set for wide vision . . .
Cool, well ventilated . . .

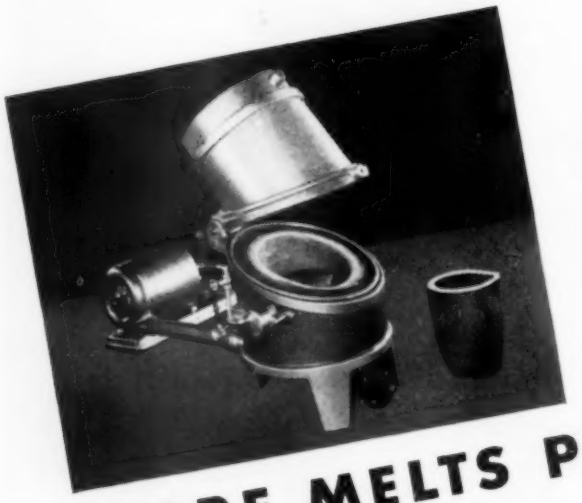
AO Duralite Goggles—sturdy yet lightweight—are equipped with impact resisting AO Super Armorplate Lenses that provide maximum possible protection from chips that come from *any direction.*

The individual eyecups are anatomically designed and have rounded edges for comfort. They are also especially well ventilated to reduce any possibility of fogging.

AO Duralite Goggles have a one-piece adjustable headband that allows a secure yet comfortable fit, will not catch the hair, and is resistant to perspiration, oil, water and grease.

Write your nearest AO Branch office for complete details.

American Optical
COMPANY
SOUTHBRIDGE, MASSACHUSETTS



SPLIT BODY DESIGN insures MORE MELTS PER DAY!

Note the unique Split Body Design of the Iler Crucible Draw Furnace. That feature, exclusive with Iler, provides definite advantages for every non-ferrous foundry operation. The crucible is quickly and easily removed and replaced. A special open-side shank eliminates all need for tongs or overhead handling equipment. Pouring is direct from crucible, no overheating nor transfer of metals. Closed upper section plus fast opening and closing prevent heat loss, insure faster melts. An automatic air lift opens and closes the furnace at the touch of a valve, saving time and heavy lifting. The furnace sets on legs above the floor; no pit is required.

Iler Crucible Draw Furnaces are available in 50—70—90 and 125 sizes to accommodate standard crucibles. Offered for either gas or oil operation.

Check Iler time and money saving features for your own non-ferrous work. Send for illustrated folder and prices.

THE FEN MACHINE CO.
1350 BABBITT ROAD
CLEVELAND 17, OHIO

ILER
CRUCIBLE
DRAW FURNACES

QUALITY • DEPENDABILITY
UNIFORMITY • PRODUCTION
. . . Vital in the Casting of Metals

FOUNDRY SPECIALISTS

A highly skilled staff of Foundrymen . . Engineers . . Metallurgists

SPECIALISTS IN:

- Methods for Improving Production and Decreasing Costs
- Metallurgical Control and Standardization
- Mechanization and Modernization
- Scientific Foundry Management
- Manufacture of Centrifugal Castings

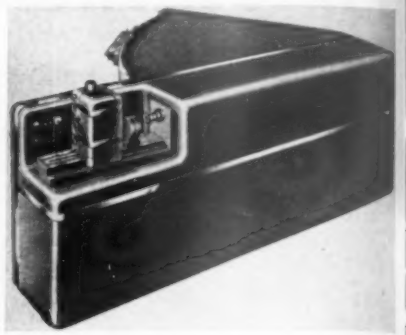
High Alloy Steel Centrifugal Casting showing cross sections formerly made from a series of forgings. Thin section 1/16-inch—100 per cent X-Ray Inspection.

W. G. REICHERT ENGINEERING CO.
1060 Broad Street —*Foundry Specialists*— Newark 2, N. J.

(*Continued from page* 248)

Chicago 5, has developed a cold cathode fluorescent lamp which can be operated on low voltages and which has a life expectancy of 10,000 hours. The company has also developed a new line of baked enamel industrial fixtures which may be had in 2-lamp and 4-lamp models for mounting singly or in continuous lines.

Spectrograph— Harry W. Dietert Co., 9330 Roselawn Ave., Detroit 4, Mich., has developed a two-meter grating spectrograph, designed for analysis of highly alloyed ferrous metals and



other materials containing complex spectra. Capable of identifying 72 elements, it may be used for sorting and miscellaneous or research applications, as well as routine or research quantitative analysis. Controls are located at the same end of the instruments as a 24 in. camera, movable on a radius arm, which allows positioning for any 20-in. portion of the total 60-in. spectrum. Single control panel governs shutter timing, camera and aperture racking and grating door opening. Outside dimensions of the spectrograph are 8 ft 9 in. x 6 ft 6 in.

Truck Gear— Market Forge Co., Everett, Mass., has developed a standardized running gear for heavy duty industrial trucks. With only two types of

wheel supports, six distinct types of trucks can now be made. Examples illustrated show level or nontilt type trucks and a tilt type with one swivel

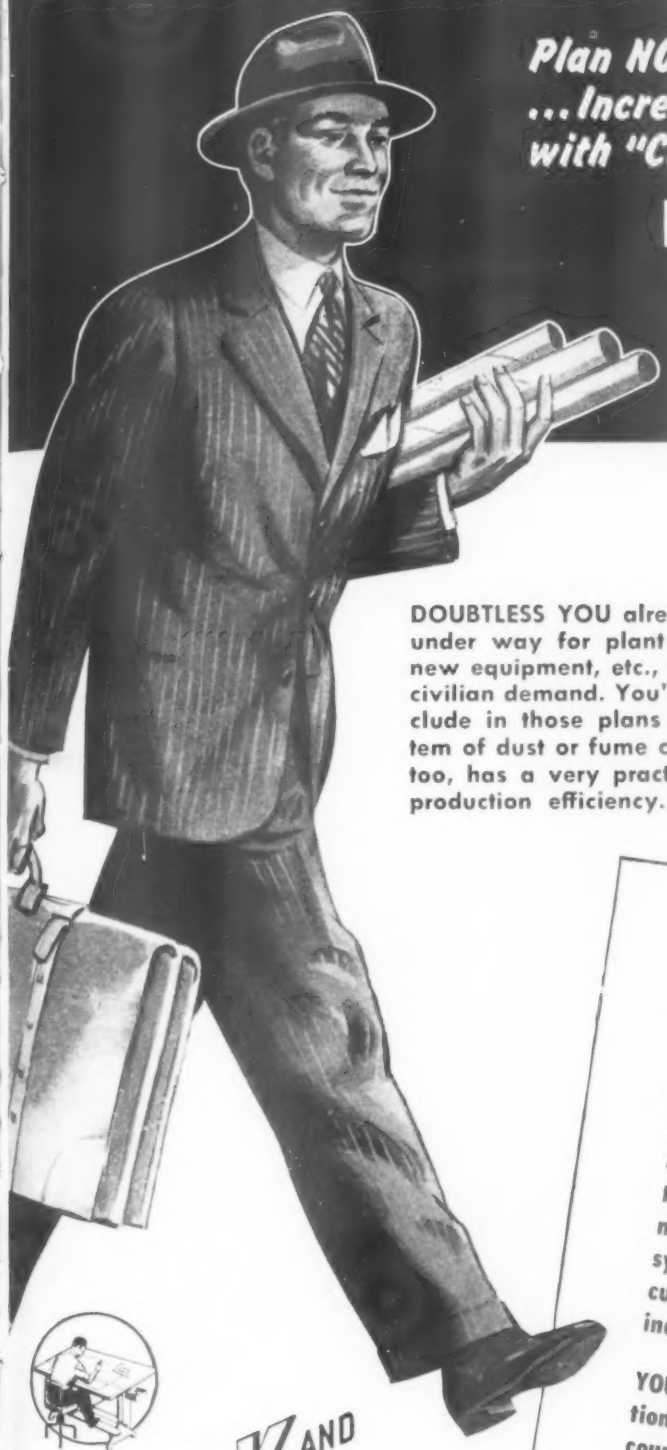
(*Continued on page* 252)

MEET KEENER COMPETITION

Plan NOW to Safeguard Workers' Health ... Increase Production ... Lower Costs ... with "Custom-Built"

DUST and FUME Control

If "competition is the life of trade," the trade of the not too distant future is destined to be the liveliest on record.



DOUBTLESS YOU already have plans under way for plant modernization, new equipment, etc., to meet coming civilian demand. You'll be wise to include in those plans a modern system of dust or fume control—for this, too, has a very practical bearing on production efficiency.

DUST AND FUMES not adequately controlled lower the output of workers, increase costs, add to health and accident hazards, and induce overly rapid deterioration of machinery and equipment.

IN INDUSTRIES everywhere, dust and fume control systems planned, designed, and installed by Kirk & Blum Air Engineers are right now paying for themselves in increased worker efficiency and maintenance of stiff production schedules. K & B systems give superior service because they are custom-built to fit the particular needs of each individual plant.

YOUR ONE BEST assurance of complete satisfaction in dust or fume control lies in the unbiased counsel and expert planning of Kirk & Blum Engineers—backed by 38 years of professional "know how". For details, write to The Kirk & Blum Mfg. Co., 2808 Spring Grove Ave., Cincinnati, 25, Ohio.

KIRK AND BLUM

IMMEDIATE DELIVERY

on the

NEW

"RAPID" HAND SQUEEZER

$122.00

Will handle a lot of your bench jobs and save you money by trebling your production.

Handles flasks up to 16 x 30 inches. Comes complete with benches. Portable or Stationary Type.

★

"RAPID" R9X JOLT

30% increased jolt capacity

$205.00

JOLT VALVE KNEE-OPERATED

A Foundry producer of good molds for over 20 years.

Simple to operate.

Squeeze Plate quickly adjusted. Low initial cost.

★

Write for NEW descriptive folders and Price Lists.

PIONEER

MANUFACTURING CO.

Molding Machine Manufacturer for Over 20 Years

MILWAUKEE (West Allis) WISC.

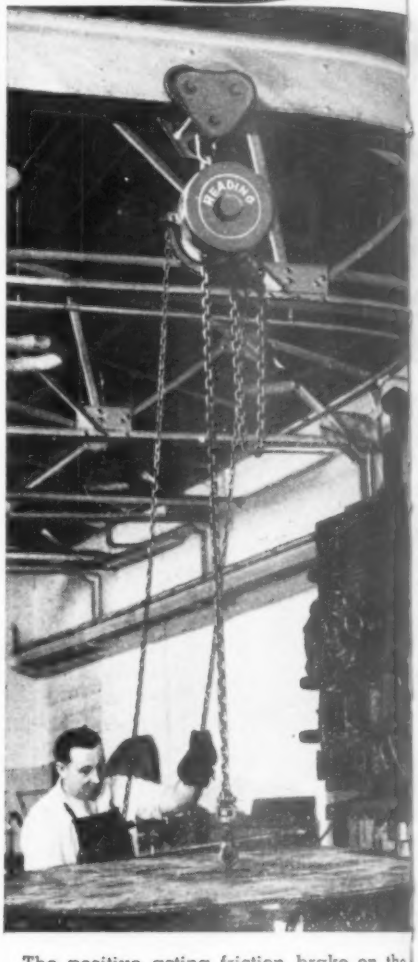
(*Continued from page* 250)

caster on each end. By the addition of wood or fabricated steel deck any length or width may be obtained with the same standardized running gear. Large wheels are 12 in. dia x 2½ in face. Maximum capacity of 5000 lb. is assured. In addition to those illustrated, four other styles may be built from the same basic truck: Six-wheel tilt type with two bull wheels and four swivel casters; dolly type with four swivel casters; tilt type with two bull wheels and one rigid caster at each end; and wagon or fifth wheel type, which is provided with twin steering wheels and pivoted front axle with safety handle held up by spring when not in use, facilitating use where floors are rough. Anti-friction bearings are standard in all wheels.

Lubricating Cart: Alemite Division of the Stewart-Warner Corp., Chicago, announces a new cart designed to provide a complete, compact, portable, lubrication department for industrial plants. The unit, intended for one-man operation, is mounted on ball-bearing casters, and is 21 inches wide, 31 inches long and 37½ inches high. The basic model carries two 7-gallon tanks equipped with low pressure pumps with 5½-foot hose and non-drip nozzles for filling oil reservoirs on machines or hydraulic systems, and for filling gear housings; one 7-gallon tank with high pressure pump for loading handguns; two 1¾-gallon tanks with oil transfer pumps for filling oil cans; six spout-type oil cans, and four lever-type handguns. The second model also has a high-pressure, hand-operated grease pump which holds 30 pounds of lubricant and has a 5½-foot lubricant hose fitted with hydraulic coupler. This pump develops up to 7000 pounds pressure per square inch, and can be lifted clear of the cart and carried to a point of use, if desired.

ELECTRODE: Eutectic Welding Alloys Co., 40 Worth street, New York, has placed on the market a new coated bronze alloy electrode for the arc welding of bronze, brass and copper. A newly devised flux coating makes it suitable for use either on AC or DC current. Electrodes are ⅛ and $\frac{5}{32}$-in.

TO HOLD LOADS *Accurately* **WITH SAFETY**



The positive acting friction brake on the Reading Multiple Gear Chain Hoist makes possible accurate positioning of the work or load with complete safety.

The maple inserts in the brake wheel hold the load tightly against the friction disc till the load is to be moved. Lowering requires only that the operating chain be pulled in the down direction. The load lowers without slipping or speeding up.

Each Reading Multiple Gear Chain Hoist is so well built that it has a guaranteed overload capacity of 25% in every size from ¼ ton to 25 tons.

Investigate Reading Hoists for your materials handling problems. Consult your distributor or write us direct.

READING CHAIN & BLOCK CORPORATION

2131 ADAMS ST., READING, PA.

CHAIN HOISTS • ELECTRIC HOISTS

OVERHEAD TRAVELING CRANES

READING HOISTS

Lift Truck Guards: Towmotor Corp., 1230 East 152nd street, Cleveland 10, has developed overhead guards to fit all of its lift trucks, which provide maximum protection for operators. Constructed of steel tubing, the guards come in two standard sizes, extending in front

of, over, and behind the operator. Transverse length of 1½-inch steel tubing in front and above are notched and welded to side members of frame. Back sections of the side frame members are made of 1½-inch standard black steel tubing, while front sections, which telescope over the back sections, are 2 inches in diameter. The guards can be installed in 10 or 15 minutes by means of bolts and clamps which are furnished, and no cutting or drilling on the frame is necessary.

Arc Converters: Allis-Chalmers Mfg. Co., Milwaukee, has developed a new mercury arc converter designed for the purpose of electronically changing power at commercial frequencies of 60 or 25 cycles into 1000 to 2000 cycle power. It is particularly suitable for supplying power for forging, melting and metal treating applications where large masses of metal or metal parts must be efficiently heated with this power at kilowatt capacities of 250, 500, 1000 and higher.

Magnet— Dings Magnetic Separator Co., 509 East Smith St., Milwaukee 7, Wis., announcees a new use for its alnico horseshoe magnets that of inspecting castings and welds for flaws in metal thickness up to 1 in. The magnet is placed on the underside of the surface; the magnetic sprinklings which are spread on the upper surface are induced by the magnet to collect at any existent minute internal or external cracks and to show up clearly as a line of powder. This magnetic inspection method is used where certain critical areas are known to develop cracks, or for exploring surfaces of castings. The magnets are 2½ in. wide and 1 in. high. Pole bases are 3/4 x 3/4 in.

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HOUSEKEEPING AND ACCIDENT PREVENTION

(*Continued from page* 91)

a foundry can be a reasonably safe place in which to work—as safe as any industrial plant. But, by and large, a reduction in the frequency of accidents would appear to be a significant undertaking for many foundry operators to consider.

As one who has a keen interest in foundries, arising from a ten-year hitch in the business, it seems to me that one sound approach to employ in bettering a poor accident record in a foundry is to set about improving the housekeeping. It does not strike me as being idealistic or impracticable to believe that many accident frequency rates could be halved if good housekeeping in all its phases, was made an integral part of shop operating procedure.

"Good housekeeping" and "poor housekeeping," as terms to describe the degree of cleanliness and orderly arrangement in a foundry, are commonly used. When one begins to investigate the factors which affect housekeeping, however, it soon becomes evident that these terms are rather generalized expressions involving a number of different factors.

More Than Storage Space Needed

A definition quite frequently used for good housekeeping says, in substance, that "there should be a place for everything and everything should be in its place." This statement is not as simple as it sounds, however, because tools and materials in production are moving and may very properly, at different times, be at rest in different places. This merely means that housekeeping is not solely a matter of storage (racks, fixtures, bins, etc.). Storage facilities are designed primarily for tools or equipment not in use or material not being processed. Much more than storage arrangement is necessary for good housekeeping.

Housecleaning is another factor in housekeeping. A foundry may be very well laid out and equipped with facilities for storage of equipment, handling material, etc., and yet, owing to the lack of an effective housecleaning procedure, may be messed up most of the time. Routine housecleaning, to a large measure, is a responsibility shared by all shop personnel. In smaller foundries, a thorough job of keeping individual work areas in order takes care of the bulk of the housecleaning. In larger shops, a clean-up crew is essential.

Housecleaning is made easier and less involved, of course, if there are adequate provisions for storage, and steps have been taken through arrangement and good operating procedures to minimize the amount of housecleaning required. One of the major factors, for example, in reducing the need for housecleaning around sand processing devices, casting cleaning equipment, etc., is effective maintenance of equipment and exhaust ventilation to reduce leakages or spillages.

A third consideration in housekeeping, which has a direct bearing on storage arrangements and housecleaning is the planning of operations to control the movement of material and parts in process to minimize congestion, rehandling and the development of "bottlenecks." This phase is one of the most difficult to handle in many foundries owing to a real lack of space—real as compared to the situations where apparent lack of space is due primarily to poor utilization of available space.

When a department or work space is inadequate in area, and the jamming up of material in process is making good housekeeping practically impossible, it is generally the case that production efficiency and safety also have been adversely affected. Expansion or relocation are imperative in such instances if fundamental steps are to be taken to improve conditions. Quite often, however, congestions in particular sections of a foundry can be eliminated by better timing of material movements, lay-out changes to utilize space more effectively, use of material handling equipment to permit more flexibility in transport, change in method or any one of a dozen approaches which will tend to smooth out the production flow and result in more production per square foot of available space.

A fourth phase to be noted in this general proposition of foundry housekeeping is the selection of method to expedite or facilitate housekeeping. When investigating possible methods of doing a particular job, it is in order to consider the effects that variations in procedure will have on the general housekeeping problem. If a new job or operation is going to be undertaken and little or no thought is given to the factors discussed previously as parts of housekeeping, it is common to find that a fairly decent housekeeping program is unnecessarily burdened or upset.

Good Housekeeping Principles

On the basis of the foregoing, it is obvious that good foundry housekeeping is not merely a job to be handled by a clean-up gang. If housekeeping could only be achieved by clean-up labor, in shops of any size, it would become prohibitive in cost. It is this inadequate approach to housekeeping which has probably bogged down more foundry housekeeping than any other single factor. It is pretty much like shoveling sand against the tide.

Good housekeeping begins with the provision of adequate facilities for the receiving and storing of incoming raw stocks. The planned flow of material or work in process from this point on to reduce congestion, unnecessary rehandling, breakage, spilling, etc., is an important factor in good housekeeping. It is axiomatic that housekeeping is made easier and less costly to the degree that control of material flow is exercised. If congestion of work in process, for example, is the cause of cluttered "bottle-

necks," it seems of little purpose to stress the "Clean-up and pick-up" idea—there being, in most such instances, no place to put the "picked-up" material. The basic answer may lie in the provision of better storage facilities, more control of the flow of materials, re-routing, speedier handling or processing operations, re-arrangement of operations, etc., to eliminate or reduce the occurrence of "blocks."

Disposal of waste and refuse regularly produced should be planned carefully. Frequent clean-ups should be arranged to prevent *excessive* accumulations. If the clean-up of waste is carried on regularly, it can be handled with a minimum of expense and disruption of production. A great deal of housekeeping is made difficult because conditions are allowed to get out of hand over a period of time. Regular disposal of waste is an important part of planned material flow.

When installing equipment, provisions should be made, wherever possible, to facilitate housekeeping. In many instances, floor area around the new machine unit or floor job can be planned for the spotting of material, installation of conveyors, necessary racks, bins, etc., to create a neat and orderly work station. In other words, housekeeping is "built into" the lay-out and worked into the general scheme of shop operations without creating additional housekeeping burdens.

Avoid Defective Equipment

A primary cause of poor housekeeping is faulty maintenance of equipment which results in inefficient handling, and leakage, breakage, spillage, etc. A simple example would be a defective wheelbarrow used in handling loose material which, because of its battered condition, produces spillage or leakage of material on the floors in the areas in which it is used. Leaking containers and pipes, broken-down bin walls, defective trucks, broken skids, battered tote boxes, etc., are similar items that often produce poor housekeeping conditions, because of poor maintenance.

Good housekeeping exists in many foundries throughout the country today. It would probably be found that in most instances, a considerable period of time was required to build the program. In addition to putting the foundry in good shape and planning procedures, an educational program to obtain the co-operation of employees is an important factor in achieving success. Good housekeeping in such cases is built into shop operations; it is not something superimposed or superficial.

Getting down to straight accident prevention, let's take a simple illustration, using a wheelbarrow again. A man loads a wheelbarrow with small castings and starts to push the load to another location. On the way, he has to juggle the wheelbarrow through a narrowed gangway where someone has left a pile of bottom boards. The man with the wheelbarrow eases his load around the obstruction successfully, but 20 ft. farther along he has to let the wheelbarrow down and pull away a 4-wheel truck which has

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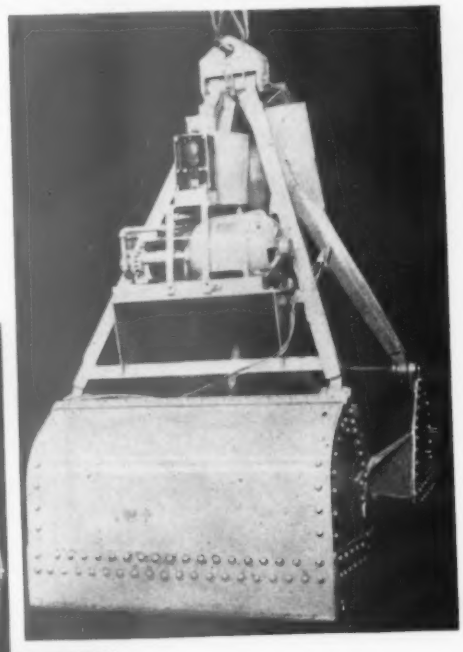

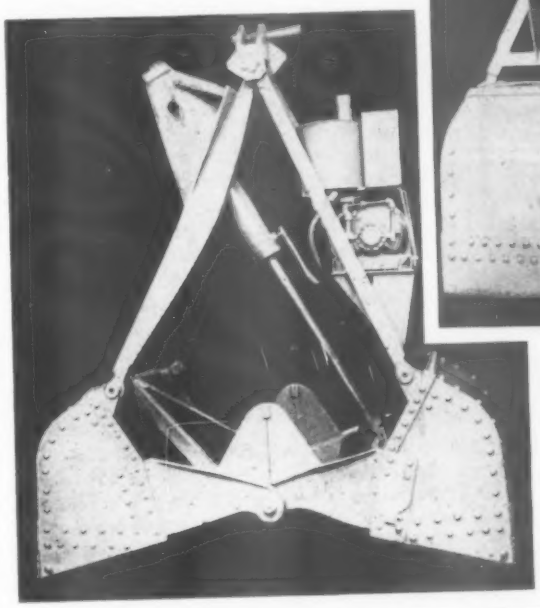

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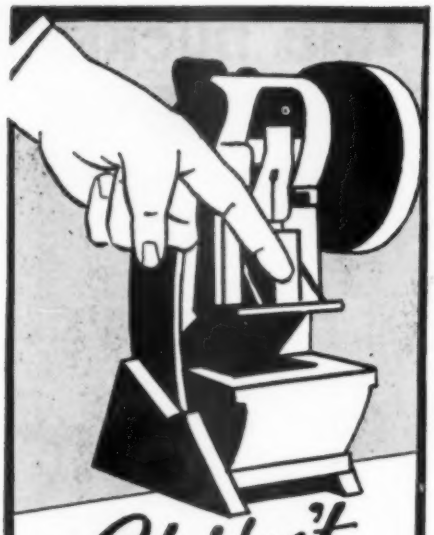

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been left where somebody found a place to leave it. The man tugs the truck clear by puling it ahead into another clear spot. He goes back to his wheelbarrow and a few feet farther along, he up-ends the wheelbarrow and in so doing hurts his back because, as he tries to clear the wheelbarrow, he stumbles over a casting which had rolled off a pile of castings in back of him.

Now this an imaginary sequence of events, but it is more typical than far-fetched where housekeeping is second grade. The man could have had an accident two or three times. The wheelbarrow might have tipped over when he was maneuvering it by the misplaced bottom boards; he could have wrenched himself or taken a spill horsing the 4-wheel truck out of his way; and he might have had tough luck in picking up the wheelbarrow on either of the two extra performances he had to go through in starting and stopping.

From the accident prevention standpoint, an important point is that the *number* of exposures to accident was increased. Depending upon the degree of housekeeping, the number and seriousness of accident exposures can be controlled.

Maintain Clean Floors

The American Foundrymen's Association manual *Recommended Good Safety Practices for Protection of Workers in Foundries* contains the following excellent statement on floors: "All floors shall be kept firm and level and shall be cleaned and levelled as often as is necessary to provide and maintain safe working conditions." This is a primary undertaking. In most foundries where housekeeping is unsatisfactory, floors or floor conditions can be used as a starting point for improvement. The first step, of course, is to remove accumulations of waste sand, unused equipment, supplies, etc. In doing a thorough clean-up job, the question of improved storage facilities comes up automatically. Take, for example, the possible turn of events during a floor clean-up job starting with a supply of clamps found half buried around the base of a building column. There may be a quarter of the clamps which were made for a special job, and are seldom used; they should be stored where they can be found easily if needed. Some clamps may be in poor condition, sprung out of shape, etc., and unsafe for use. These should be scrapped. When the usable clamps finally are salvaged, it may become evident that there is a shortage of certain sizes; and for purely production reasons, it would be smart to make up some additional clamps.

Carrying this example along, we finally have an adequate supply of clamps regularly used stored in clamp boxes or bins around the floors and we have a general storage for special or seldom used clamps. This approach expanded to cover all types of tools, small rig, supplies, etc., encountered in floor clean-up problem may very easily be the beginning of a complete plan for proper storage facilities for shop rig and supplies. It started with the proposition of cleaning up the floor and in doing some planning and taking some action to keep them picked up!

Floors include gangways. Cluttered gangways are not too common on molding floors where iron is carried in handshanks. They cannot exist and have the work done. However, every once in a while, where housekeeping is on the loose side, weights, skimmers, riddle refuse, over-iron, etc., are allowed to creep over into aisle space which should be kept cleared. The maintenance of gangways is the concern of everyone. It should be a cardinal rule that gangways are clear.

On floors where heavier work is made, the amount of rig, plates, bars, lifting rig, weights, etc., etc. often will assume large proportions. It is not always practical to build racks, stanchions and whatnot to maintain stock room orderliness, but it is possible to establish definite floor areas for storage and to maintain good piling and general neatness.

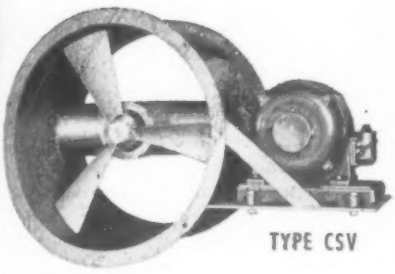
A *single* "bad spot" in a floor, gangway or other working area may often create several types of accident hazards and production interruptions. For example, a "break" in the floor surface of a working area usually will be an outright tripping hazard, setting the stage for a harmful stumble or fall. The broken floor makes the handling of shop trucks more difficult, often causing spillages, and where hand trucks are used, a lot of extra hauling and heaving is required which may be the eventual cause of a strain or hernia injury. Poor footing can be the actual reason why a man becomes tangled up in slings on a crane lift or gets his hand jammed in between a couple of flash sections, etc. The point is, that a relatively minor condition of faulty housekeeping or floor maintenance may kick back from many directions and when it is corrected the benefits are more than are often recognized.

Housekeeping Is Continuous

It is outside the scope of this particular discussion to attempt to cover all the factors which affect foundry floor conditions—or any other specific item of foundry housekeeping such as storage of flasks, rig patterns, etc., methods of floor maintenance, waste disposal, dust control, etc. Each individual shop presents its own problems. Hundreds of "trick" solutions have been worked out to meet definite requirements. A good purpose would be served if more accounts of these innovations were to break into print. There is a lot of "light" on foundry housekeeping hidden beneath "flasks and core boxes" which if uncovered might help in the growth of more interest in improved housekeeping and accident prevention.

Good housekeeping cannot be firmly established in any foundry unless management and supervision take the lead. Housekeeping should be a continuous, day-in-and-day-out activity, a part of every job, and not a superficial puttering around every year or two.

It is essential that a definite under-



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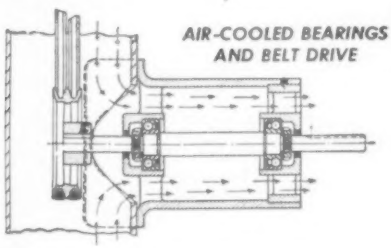

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standing be established with all shop personnel to the effect that good housekeeping is recognized as an essential part of shop operating procedure and that management is specifically concerned with the elimination of wastages of labor, materials and accident hazards chargeable to poor housekeeping.

In several articles which have appeared in THE FOUNDRY in recent years, the accounts of the interest which shop people have taken in carefully worked housekeeping programs has been very heartening reading. Good housekeeping pays dividends in improved safety and in uninterrupted production.

Install Windbox in Record Time

One of the many instances where vital production schedules are maintained despite unusual wear and tear on essential equipment was exemplified recently at the Cooper-Bessemer Corp., Mount Vernon, Ohio foundry when the old windbox on the cupola was replaced by a new unit with the loss of only one day's operation.

The old lining was removed Friday night after melting a 53-ton heat. Shoring up began early on Saturday. Steel *H*-beams were placed upright under the charging floor to hold the top part of the stack in place. A crane hook was attached to the bottom ring to hold it in position, and then the legs were removed. The bottom ring was cut loose from the windbox, lowered to the foundry floor and dragged away by a main floor crane. The charging crane was rehooked to the old stack and cribbing was installed underneath to guard against and swing or twist when the stack was cut loose. The old windbox was detached, lowered to greased rails and taken away by block and cable. The new windbox was slid under the charging floor by the same method and supported by cribbing until partly welded. The bottom ring was raised into place and all sections finish welded.

The old sand stone foundation was cleared off and a heavy steel frame set on a foundation to level up. Legs were bolted and welded to the steel frame. Brick layers, millwrights and electricians completed their part of the work. The job was finished in time to run off the usual heat on Monday.

Ohio Steel Honors Employees

The Quarter Century Club of the Ohio Steel Foundry Co., Lima, O., was organized at a dinner held June 22 at the Barr Hotel in that city. Guests of the company were 97 employees who have at least 25 years of service.

Permit has been issued for construction of a new foundry building at 5035 Firestone Blvd., South Gate, Calif., for J. R. Cady, to cost $4000.

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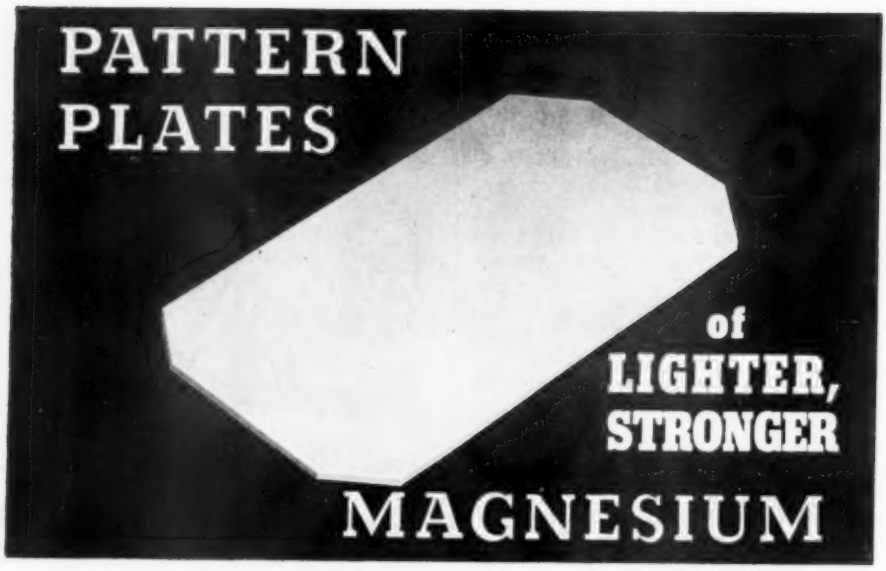

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11 x 16	8.05	13 x 24	12.55
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MELTING FURNACES — Bulletin No. 501, a four-page folder offered by Stroman Furnace & Engineering Co., 300 West Adams St., Chicago 6, describes an improved reverberatory furnace for melting brass, copper, aluminum and other alloys. Metal is charged through a hopper which is also the exhaust from the combustion chamber. The metal is then preheated and melted in suspension in the hopper and trickles down into the metal bed. No cold metal reaches the molten bath. The combustion chamber is heated by the same fuel as used to melt the metal in the hopper.

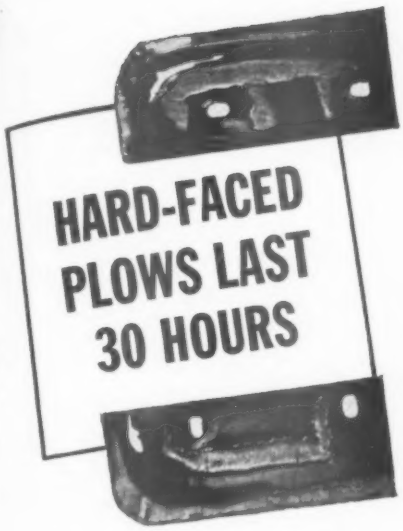
COMBUSTION FURNACE — Harry W. Dietert Co., 9330 Roselawn Ave., Detroit 4, offers a leaflet describing a combustion furnace especially recommended for steel laboratories running carbon analyses. The four heating elements used in the furnace are placed at right angles with the combustion tubes, the ends of the heating elements projecting through the sides so that the heat may be efficiently applied to a restricted portion of the tubes where the heat is required to completely burn the sample.

PROTECTIVE COATINGS—Carbozite Corp., Pittsburgh 22, has issued a manual which lists each type of protective coating manufactured by the company, with detailed information for proper application. Rust preventives, wood primers, aluminum, copper, mine car coatings, traffic coatings, floor coatings, and carbozite mastics are described.

HEAT TREATING—A. F. Holden Co., New Haven 8, Conn., in a new 4-page folder features a combination tool steel and high speed hardening unit, manufactured in three standard sizes. The folder also contains a list of heat treating baths manufactured by the company, with their respective melting points, operating ranges and uses.

WIRE CLOTH—Catalog No. 12, published by Buffalo Wire Works Co. Inc., 425 Terrace, Buffalo 2, is a reference book for users and purchasers of industrial wire cloth. The catalog contains 56 pages of data covering mesh, space, gauge, percentage of open area, proper screen, types of weaves and selection of metal.

SHIPPING BOXES—C. H. Dresser & Son Inc., Hartford 5, Conn., has available a 4-page folder describing a line of collapsible shipping boxes designed to carry anything from packaged parts to loose rough castings. When unloaded the boxes can be collapsed and returned



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ELECTRONIC CONTROLS—Catalog Z-6300, a 12-page folder recently published by Wheelco Instruments Co., Harrison and Peoria Sts., Chicago, outlines the company's electronic principle by which control is effected without contact between measuring and control units of an instrument, and gives brief descriptions and prices of indicating pyrometers, resistance thermometers, input controllers, portable potentiometers, combustion safeguards, thermocouples, etc.

CHEMICAL CLEANERS — Klem Chemical Works, 1500-18 East Woodbridge street, Detroit 7, is offering an eight-page folder describing the use of phosphoric acid cleaners, alkali power wash and still tank cleaners, compounds, and enamel for paint removers. On the inside of the back cover is a layout chart of the concentrations of the cleaners used for respective work and under specific conditions.

TOOL-HOLDERS BITS—A new six-page folder containing useful information on tool bit selection has just been prepared by the Carpenter Steel Co., Reading, Pa., which shows the types of bits to use for intermittent cutting; fast, continuous cutting; fine finishing; and hogging or rough turning operations. Price list is included.

MACHINING—Ampco Metal Inc., 1745 South 38th St., Milwaukee 4, has published a 12-page bulletin, No. 66, based on practical experience in machining Ampco metal and aluminum bronze alloys. Illustrated with diagrams and photographs, it treats the various phases of machining, such as machining practice, gives a table of recommended lathe feeds and speeds, and discusses tool design and inspection.

ENGINE MOUNTINGS—A simplified means of selecting rubber insulated engine mountings that stop engine vibration is contained in Bulletin BU-23, issued by Bushing Inc., 3442 West Eleven Mile Rd., Berkley, Mich. The bulletin contains a simplified formula for calculating the proper mounting for any given load, as well as dimension drawings of four typical mountings capable of handling loads of from 20 to 600 pounds.

STORAGE BATTERIES — Philco Corp., Storage Battery Division, 467 Calhoun St., Trenton, N. J., has compiled a complete summary of information on various industrial applications of storage batteries in manual form including facts, specifications, capacities, discharge curves and illustrations for all types and sizes. Motive power and stationary batteries are covered, together with maintenance and export data, all fully indexed with helpful cross references.

X-RAY DIFFRACTION—Picker X-Ray Corp., 300 Fourth Ave., New York, is offering an illustrated, 28-page bulletin discussing some of the common applications of X-ray diffraction, as well as a description of the type of equipment used in this work. Typical diffraction radiographs and their interpretation are included.

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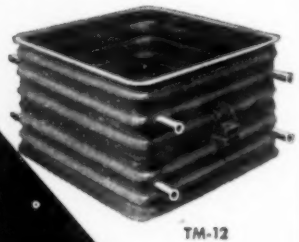

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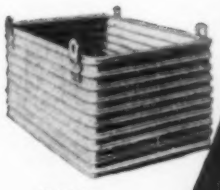

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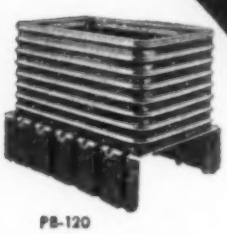

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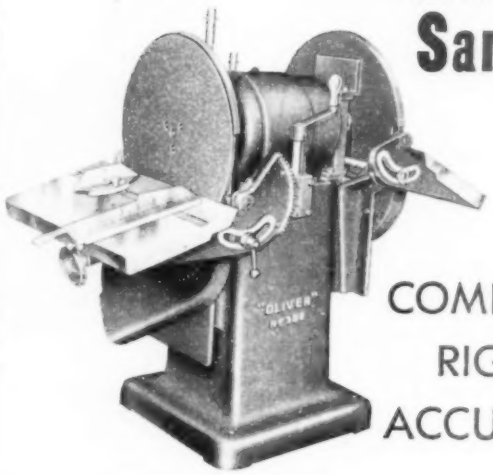

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